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SETTLING THE SNAKE RIVER VALLEY.



HEADGATES OF THE GREAT WESTERN CANAL.

to be the greatest of American States for the farmer in the future. They base their confidence first, on the well known advantages of irrigation, second, on the marvelous qualities of the soil, and, third, on the enormous water supply furnished by the Snake river. No portion of the arid region is better watered than this part of Idaho and there are few places where the supply is anywhere near as great. In the neighborhood of Idaho Falls is one of the largest systems of canals in the West, and one of the best of these is that belonging to the Great Western Canal and Improvement Company, which serves the 40,000 acres now being placed upon the market by the company of gentlemen referred to. This canal was built by the private means of its owners and is entirely out of debt. Its works are of a substantial character and its ability to supply water is beyond all question.

Idaho Compared with the Old Northwest.

The present remarkable movement of settlers to the Snake River valley, especially in view of the fact that many of them are leaving the best parts of the older States, requires an explanation. There is but one fact that could justify it, and that is that the average family can make more money in Idaho than in the Central Western States. Nowhere can there be absolute assurance of crops, year in and year out, without irrigation. So the first advantage which the farmer will gain by going to Idaho is the certainty of his crop when insured by irrigation. In the best portions of Central West the average crop of wheat is eleven bushels per acre. In the Snake river valley of Idaho on irrigated land forty bushels per acre is a



HARVESTING APPLES IN AN IDAHO ORCHARD.

low average. In other words, *an acre in Idaho will produce four times as much wheat as an acre in the Central West.* Here is the second tremendous advantage of the new country over the old. The third advantage will be found by a study of land values. The Central West can hardly expect to grow much in the next ten years. Land values will not rise appreciably, but Idaho is a very new State. Its growth must be certain and large. Lands that can be bought to-day for \$15 per acre will be worth four times as much as they become improved and as the country grows. This is an element always very influential with settlers. It is true that in Idaho the settler must pay for water, but this cost is more than equalized by the fact that he loses no time on account of rainy days, nor is his crop injured by untimely storms. In the matter of climate Idaho has another advantage, for statistics prove it to be the healthiest climate in the United States. The undeveloped resources of Idaho are rich and varied and the home market offered by growing towns, mining camps and other industrial centers is a very important point to be taken into consideration.

The Settler in the Snake River Valley.

The new farms in the Snake River valley range from 40 to 80 acres in size. The prices at present for land, including perpetual water right, are from \$15 to \$20 per acre. The man who buys 80 acres pays \$2 per acre down, or \$160, and pays the balance in seven annual payments, bearing interest at 7 per cent. The Great Western Land and Irrigation Company has

SETTLING THE SNAKE RIVER VALLEY.

made a careful study of how an eighty-acre farm can be handled. It is their habit to go over every detail of the matter carefully with the intending purchaser, showing just what the expense and income would be over a series of years and planning the best disposition of his lands. The company's estimates are based on the following figures: Irrigated land in Snake River valley produces 40 bushels of wheat per acre, selling at 50 cents per bushel; 250 bushels of potatoes per acre, selling at 30 cents per bushel; five tons of alfalfa per acre, selling at \$6 per ton; 70 bushels of oats per acre, selling at 20 cents per bushel; one and a quarter tons of timothy per acre, selling at \$13 per ton.

They have numerous testimonials from actual farmers now living in the locality to demonstrate that these are conservative estimates. Reckoning on this basis they easily show that farmers can net from \$1,000 to \$2,000 above all expenses on an eighty-acre farm.

Great Western Land and Irrigation Company.

The character of the company which has had such wonderful success in the sale of these lands in the Snake River valley can be readily judged from what has been said elsewhere in this article about the five prominent gentlemen connected with it. Their reputation is of the highest. It goes without saying that the public confidence which they have won by so many years of successful work in directing settlers they certainly do not intend to forfeit now in their new enterprise. Settlers going to a new country are obliged to depend to a considerable degree upon parties selling them the lands. There is every reason to believe that the confidence which Scandinavians generally feel in the Great Western Land and Irrigation Company is richly deserved.

It has been impossible within the limits of this article to discuss everything that it would be interesting to discuss from the standpoint of the settler. Attractive literature giving fuller particulars about the character of the climate, soil and products, the educational, social and religious advantages offered by the promising city of Idaho Falls, etc., can be had by applying to the Great Western Land and Irrigation Company, 97 Washington street, Chicago.

The officers of the company are as follows: President, G. Wallenberg; Vice-President, N. E. Wenstrand; Secretary, C. A. Petterson; General Manager, E. Tyden; Office Manager, A. Osterholm.



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L. R. BRITTON, Business Manager.

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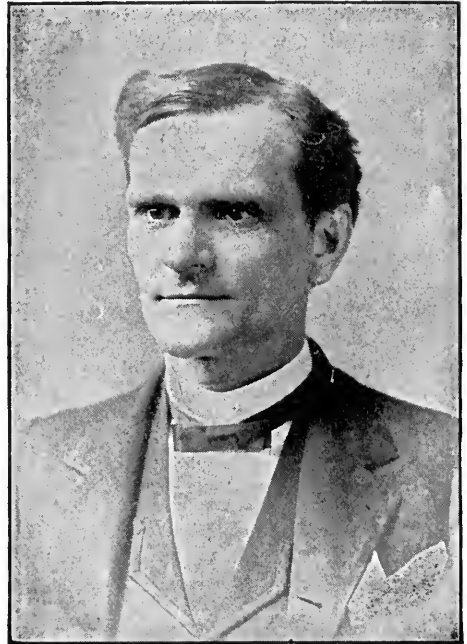
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THE PROGRESS OF WESTERN AMERICA.

The Nation and the Arid Lands. The time is near at hand when the people of the United States must deal with the problem of reclaiming the arid lands. The problem does not assert itself; the pressure is from without. All our eras of colonization have taken their impulse from men who sought homes rather than from localities that sought settlers. The Puritans were persecuted in England and dissatisfied in Holland, and so New England was born. Finally the desirable lands of the Atlantic coast were occupied, and then the Ohio Valley was invaded. Generations afterward the armies of the Union were suddenly dissolved and then the broad valley of the Mississippi was overflowed with homeseekers. The summer of 1894 finds another era of colonization at hand. Again the pressure is from without; again the resources of the West must be drawn upon to furnish outlets for surplus population. Conditions that have been swelling the ranks of the semi-idle and wholly idle for some years are culminating in widespread unrest, in well-defined want and at last, in the loud and startling demand for more land for the landless. We publish elsewhere in this number a striking article entitled "The Public Domain in its Social Aspect." This article was not written by an agitator and delivered before a club of anarchists. It was written by one of the conservative young men in the Interior Department and delivered before the National Geographic Society, at Washington. When we hear a note of alarm from these circles it is high time to be giving serious thought to our social and industrial problems. And the article of Mr. Arthur P. Davis is nothing less than a note of alarm. It is true that the article referred to points out the disease rather than the remedy, but a knowledge of the disease is a necessary prerequisite to the prescription of the cure. If the men of the East will awaken the country to a lively appreciation of the fact that something must be done, the men of the West will undertake to show the country how to do it.



COL. GEORGE W. HARRISON.

Of Atlanta, Member of the Georgia Irrigation Commission.

Western Colorado's Petition. Already public thought in the West is studiously bent upon this subject of transcendent importance. Recently some of the citizens of the western counties of Colorado sent a striking petition to their senators and representatives at Washington. They called attention to the fact that a splendid tract of land, comprising one million acres in western Colorado and eastern Utah, is susceptible of irrigation by the waters of the Grand river, and that it would cost about \$5 per acre to make this fit for settlement. They urged the Government to immediately undertake the re-

clamation of this immense tract, thus giving employment to a large number of idle men, and making homes for tens and tens of thousands of now landless and homeless families. They pointed out that the Government would quickly receive its money back from the settlers, and would thus only temporarily advance the capital required for the work. Here are a million acres, now desolate and worthless; here is a great river, pouring uselessly to the tropic sea. Marry that water to that land and lo! the voiceless desert will blossom with the homes of men! The desert of to-day will be the garden of to-morrow, for that soil is rich beyond comparison, and the climate is favorable to an extraordinary degree. How sensible and feasible the idea advanced in that petition looks upon its face, and yet with what well-nigh insuperable obstacles it is surrounded, as a measure of immediate relief! Congress is slow to act even upon matters referred to it for instant revision or repeal by the overwhelming mandate of the people. How slow, then, can it be on a new issue, and especially upon an issue presented by the people of the dis-respected West? Moreover, Colorado is but one part of the West, and the petitioners represent but one part of Colorado. Can they expect to induce Congress to act for their benefit alone in a matter which requires the readjustment, or rather the creation, of a national policy of mighty import? And, worse than all, will the East ever consent to appropriate millions for western internal improvements, and especially at a time when its incomes must be taxed to make up a deficit? No; we can expect nothing save the provocation of thought in the right direction to come from such petitions as these.

**Irrigation
Scrip
Proposed.**

The people of many States are revolving in their minds the problem of how to open the arid public domain to labor and subsequently to settlement. Here comes the *Seattle Telegraph* with a new plan. It says, and very truly, too, that "relief must be provided by the government when emergencies occur by reason of a vast number of people being unemployed is the lesson of history." It cites the policy of the Pharaohs, who put the idle Israelites at work on pyramids, canals, temples and palaces; of the Roman emperors, who employed their subjects upon great roads; of the ancient Danish kings, who built a wall across their kingdom; of the Peruvians, who also built roads. And then the *Telegraph* presents its plan for the present crisis as follows:

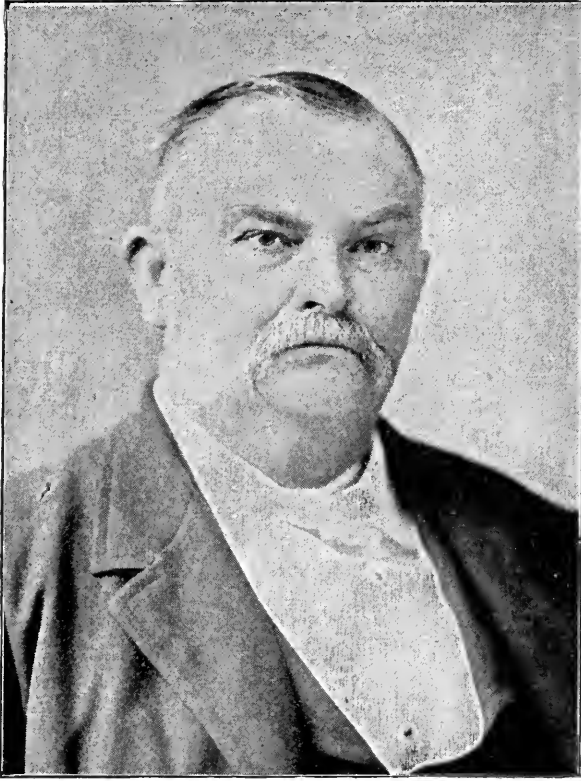
Let the United States government begin immediately a gigantic system of irrigation, the payment for the work to be in paper money receivable by the government in payment for the irrigated land. In connection with the irrigation let a complete system of highways be built through the irrigated districts. Assuming that the irrigable area is 100,000,000 acres, the total outlay would be approximately \$25 an acre, or altogether \$2,500,000,000. We do

not propose the issue of any such amount of irrigation scrip at any one time. If such a system of irrigation were begun within a year the demand for the irrigated lands would begin and the irrigation scrip would begin to find its way back into the national treasury in payment for land, when it might be either re-issued or canceled as might be thought most convenient. We assume that it would take ten years to complete the work. This would mean an average scrip issue of \$250,000,000 a year, and the probability is that after the first year the redemption of the scrip would begin and would continue with increasing rapidity.

That there is merit in this plan everybody will admit, but that it would involve national discussion and arouse the bitterest opposition no one will deny. A currency redeemable in irrigated land would be based on good security; those who held it ten years and then presented it for redemption would realize four times its face value. But we should have to fight those very potent influences in this country who do not want the circulation increased, and who regard gold as the only measure of value. The West and the South will meet those gentlemen on the field of battle in November, 1896. But let us keep irrigation out of politics if we can. Let us try to frame a plan that will avoid every known danger, if possible, and present it in the light of a business and non-political question. In that way alone can we hope to induce Congress to act quickly. The irrigation scrip plan would involve at least ten years of acrimonious conflict with our well-fed and therefore conservative fellow-citizens of the East. That would be interesting, but unprofitable. It would reclaim no deserts and build no homes.

The reader may reflect that it is easier to object to a plan than to propose one reasonably free of objection. So it is.

But it seems to us that the course which the men of the West should pursue is as clear as sunlight. The last Irrigation Congress provided each arid State and Territory with a commission of five competent and experienced men charged with the duty of ascertaining the extent of the irrigable public land and available water supply, together with the opinions of their people on national and State laws, these commissions to report fully at the next Irrigation Congress. Every citizen who has a plan to suggest should immediately put it before his State commission. The next Irrigation Congress will assemble at Denver in September, and remain in session until it has reached conclusions. There is no hope of congressional action before that time. The congress at Denver will be the constitutional convention which will frame the fundamental laws on which institutions may hereafter be built. That congress should contain a large and even representation of all the States and Territories interested. Having before it the reports of the seventeen commissions, it can certainly approach conclusions with a degree of authority never enjoyed by



MAJOR G. M. RYALS.

Of Savannah, Member of the Georgia Irrigation Commission.

any previous body of the kind. That is the time and place to formulate policies on which we can unite. This can only be done by compromises and mutual concessions. If the outcome is a measure which will command the practically unanimous support of western men and newspapers, and which does not unnecessarily antagonize the political principles of any party or section, we can certainly anticipate its speedy enactment into law. We believe such a measure can be framed, and we have not yet lost faith in the broad-minded patriotism of the American people to such an extent as to harbor the fear that they will reject it upon the ground that it will enhance the prosperity and power of the West.

Its Effect on Private Enterprise. The tendency of the times is unmistakably in the direction of public irrigation works, and it may well be asked what the effect of such a policy would be on private investments. We do not think this tendency in any important sense a menace to existing private interests, but if it were, that would be no argument against it. The public domain is the property of the

American people. They have the undoubted right to make such disposition of it as they see fit. And it is sincerely to be hoped that they will handle it in the way calculated to confer the greatest good upon the greatest number. But as a matter of fact, we do not believe the private and corporate works of reclamation now under way would be injured appreciably if the nation or the States should undertake to reclaim the deserts that remain public property. To begin with, the most desirable lands in all localities, together with their natural water supply, have already been appropriated. These lands would therefore have an advantage when offered in competition with lands less attractive or accessible. Furthermore, the private lands are ready for the settler *now*. They will be in immense demand during the next year. The public lands cannot be ready for the market for a considerable period, even if the present movement should be phenomenally successful in getting Congress to act. Still further, it is very likely that settlers possessing a little means will prefer to acquire private lands, while those who have practically nothing to start with will settle on the public domain. We are reminded of this probability by the fact that the first ditches in Utah, Colorado and Arizona were public enterprises, while all the later ones are projected by individuals and corporations. In California the people may choose to-day between public and private canals, and are quite generally choosing the latter. Settlers on private lands will have the advantage of the direction of the able men that capital can employ, and it will be very easy for such minds to plan attractions in colonies and communities that cannot be offered by purely public enterprises. If large schemes of reclamation should be undertaken immediately by public authority and direction, we should not anticipate any failure of private enterprises, for the reasons already enumerated. It is that class of projects beyond the ability or daring of private enterprise that will command the earliest attention of the people.

The Ownership of Water. In THE IRRIGATION AGE for March appeared an article on water rights by Attorney James W. Kerr, of New York, in which he denied the ownership of water, and contended that "the right of use" is the extent of the control that can be acquired over water in irrigation. In this number Mr. W. A. Hancock, of Arizona, very ably sets forth the opposite view, contending that water acquired by legal appropriation is property, subject to barter and sale, like any other commodity.



CANYON OF THE GRAND IN COLORADO.

While we are always glad to allow all sides of important questions to be presented in these pages, we wish to say emphatically that we agree with Mr. Kerr's interpretation of the term "water right" and not with Mr. Hancock's. Water, sunshine and air are natural elements, existing for the benefit and essential to the life of all. Sunshine and air diffuse themselves naturally over the earth, but water must be diverted, controlled and directed by artificial means. The man or company who "appropriates" it merely becomes a trustee for the public. The law compels him to apply the water to "a beneficial use," and, presumably, to the best good of the community, so far as it will go. The ditch is a common carrier in the sense that so long as it has water not engaged by an actual user it must deliver the water to whoever will pay for the service and apply it beneficially. The universal law that water must be applied to "a beneficial use" is in itself a denial of the right of ownership. What a man owns he may apply as he pleases. Water is public property. So it has been in all ages and countries. The public permits individuals to "appropriate" it for the good of the locality that can be reached and benefited by it, but the public can limit, regulate, supervise, and even take away, the latter for just compensation. When any other view of water ownership is admitted it will be time not merely for a king but for a slave-driver. Private investment in works will always be protected, but private ownership of water will not be conceded until air and sunshine are sold in bottles.

Georgia's Splendid Commission Committeeman Whidby, of Georgia, is the agreeable surprise of the season. He has appointed an irrigation commission consisting of eminent Georgians who have entered enthusiastically upon the work of studying the conditions for irrigation in the South, and who will also cooperate heartily with their western brethren in solving the problem of our arid lands. The amount lost by drouth in Georgia last year would have provided some very magnificent irrigation systems. The members of the Georgia commission, beside Mr. Whidby, are as follows:

Dr. H. C. White, President of the State Agricultural College of Georgia, an eminent scientist and man of culture, Athens, Ga.

Major G. M. Ryals, of Savannah, Vice-President of the National Farmers' Congress, one of the largest and most successful truck growers in the South, who is acquainted with irrigation.

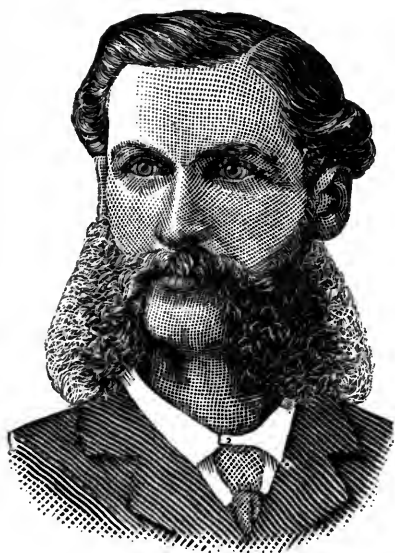
Hon. Martin V. Calvin, of Augusta, an eminent statistician, and for a decade a member of our General Assembly.

Col. Geo. W. Harrison, of Atlanta, a progressive man, who is the general manager of the largest publishing house in the South, and manager of the *Southern Cultivator*.

Three Aspects of Texas. The industrial life of Texas presents three aspects to the eye of the traveler who crosses it from east to west. From Fort Worth to the coast, which comprehends about

one-third of its stupendous territory, there is an abundant and fairly regular rainfall. Here we see the out-working of the peculiar land system of Texas under the best conditions. The farms are larger than the average size throughout the Middle West, and cotton and corn are the principal crops. The negro furnishes the manual labor. Homesteads are free of debt, as the result of the law which makes it impossible to mortgage them. Nowhere in the United States should the system of large farming bring better results than here; where the soil is fertile, the seasons long, labor cheap and abundant, and transportation facilities at least reasonably adequate. And if local testimony may be trusted, the results have not been disappointing on the average. The citizen of East-central Texas assures you that there is no better place on earth and none where industrious men have made better progress toward independence. Land values are steady, and there is no evidence of a disposition to abandon farms. The low prices, which now rule for all staples prevent extraordinary profits, but the average prosperity in this part of Texas certainly compares favorably with conditions in any part of the United States. It is when we pass to the western half of Texas that we behold its second aspect. It would seem as if fully one-third of the state, and perhaps a greater portion, is clearly within the semi-arid region. This section is no longer fit for a stock range and yet is scarcely fit for anything else. As you study its discouraged fields from the car window you are unable to perceive how the people live, and when you meet the people and ply them with questions you discover that they are as much in the dark on the subject themselves. The writer talked with one group of neighbors in West-central Texas, who stated that they had seen but two really good seasons in fourteen years. When they were asked how they lived they replied, "Really, we do not know how. We just exist somehow, getting poorer and poorer all the time." It is a pathetic sight to see horses and cattle in a condition of semi-starvation, but it is infinitely more so to see human beings in the same plight. There is an immense country in Western Texas where this condition prevails. There are portions of this section which can be irrigated from surface supplies, and probably other portions where little oases could be created from wells and other underground waters. Just how extensive an area can be reclaimed will never be known until Texas realizes the importance of inaugurating a vigorous irrigation policy of her own, beginning with the systematic study and exploitation of her water resources. This ought to be undertaken at once in the interest of her people. If they are doubtful about what irrigation means in Texas, they have only to close their eyes at night, on what

we have called the second aspect of their state and open them again in the morning, when the train has reached the Rio Grande valley, on what may be called its third aspect. The reclaimed district here represents but a narrow strip of ground, but it is sufficient to illustrate the immense possibilities of irrigation in Texas. Stretching eastward from El Paso for a distance of a few miles is a garden spot which no traveler can ever forget. Orchard, field and garden combine to present a picture of plenty. The farms are small and generally cultivated by Mexicans, but a very small patch of ground here would suffice to sustain a family. So we have the three aspects of Texas, and the most inspiring of the three is the slender finger of prosperity along the Rio Grande, which seems to beckon and show the way to enduring success for the rest of the semi-arid region.



HON. MARTIN V. CALVIN,

Of Augusta, Member of the Georgia Irrigation Commission.

One of the humors of the present irrigation movement is the attempt of Governor Osborne to make the Wyoming Commission a matter of personal politics. One of his newspaper organs has recently devoted an entire page to what it terms, in bold headlines, "An Arid Land Conspiracy." The basis of the article is the action of the National Executive Committee in taking Mr. William Penn Rogers of Messina, Cal., at his word when he announced that he considered it manifestly improper that he should represent Wyoming permanently, as he did temporarily, on the committee and appoint a commission for a State of which he was never a citi-

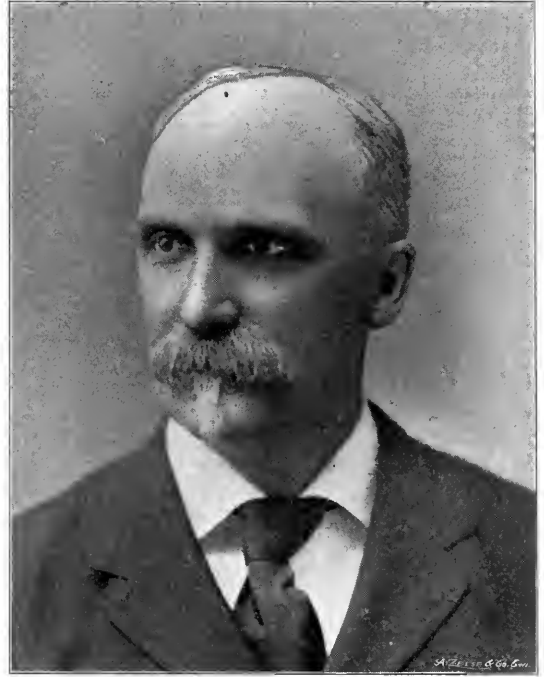
zen. Mr. Rogers declined to serve after the first meeting and the committee promptly elected Elwood Mead, the most competent man in Wyoming, to fill the place, and to appoint and preside over the Wyoming Irrigation Commission. The action of the committee at the San Diego meeting was unanimous. Subsequently, when the question of confirming the commission nominated by Mr. Mead came up, the whole subject was reviewed and another opportunity given the committee to express itself on the issue raised by Mr. Rogers, the contention that he had not and would not resign, but would insist, from his home in California, on appointing a commission for a distant State, with whose citizens and problems he has no acquaintance whatever. Again the action of the committee was unanimously against Mr. Rogers, and the most emphatic expressions of disapproval came from those members who, like Governor Osborne and Mr. Rogers, are bitterly opposed to the cession of the lands to the States. The action of the committee was perfectly honorable and straightforward. Not only that, but the movement would have been seriously embarrassed and even rendered ridiculous had it been the original and consistent plan of Mr. Rogers, rather than an afterthought suggested by the political instincts of Governor Osborne, to attempt to act for Wyoming permanently. State commissions named by telegraph-proxy delegates who reside a thousand miles or more from the scene of the commission's labors would not command much popular respect. The right of States to be represented by their own citizens, especially in a matter of such vital importance as this, cannot be questioned by reasonable men. Members of the National Executive Committee will be perfectly willing to meet the Governor of Wyoming and the gentleman from Messina, Cal., in joint debate at the next session of the Irrigation Congress. In the meantime it is gratifying to learn that the competent and non-partisan commission appointed by Mr. Mead is proceeding successfully with its work and has the very general support of the Wyoming press and public. The attempt to ruin its usefulness has already proven abortive.

There is another aspect of the matter which is personal to the editor of *THE IRRIGATION AGE* in his capacity as chairman of the National Executive Committee. It is asserted in the buncombe broadside of the gubernatorial organ that the plan of State Commissions was devised by the writer for the purpose of saving the cession movement from defeat at Los Angeles, and then packing the commissions with men friendly to the policy of cession, so as to secure a prejudiced verdict at the next Irrigation Congress. As proof of this purpose a wickedly garbled extract from a letter to Elwood Mead is presented. By using detached

sentences of this letter, and then putting his own construction upon them, the Governor tries to make it appear that the writer admitted that the plan of commissions was hastily advanced in the face of defeat and purely in the interest of the plan of cession. A fair sample of the Governor's work as an eliminator of expressions that do not serve his purpose is presented in the italic portions of the following extract, only the words in Roman type having been quoted in his account of the "conspiracy:"

I devised the plan of the State *Commissions as a means of ascertaining the real opinions of the people of the various States and gathering material for a National and State irrigation policy.* I told them we would not ask the convention to pronounce in favor of cession, but we would insist that it should not pronounce against it, *and should leave the whole matter open to patient, impartial study, without favor or prejudice.* The plan was enthusiastically accepted, with the result that discord was eliminated and a mighty interest aroused in the future of the movement.

Then follows an outline of the changed opinions of the writer on the subject of cession; of his views of what should be left to the nation and what to the States; of his confident hope that the work of the commissions will "result in wise compromises, great and harmonious national and State policies, and the realization of that mighty future which we all desire to see under way." Read in its entirety the letter furnishes the most ample proof of good faith. Governor Osborne saw this so plainly that he did not dare to print it in full. The plan of the commissions was not a sudden expedient invented to meet an emergency. It was the product of months of study, conference and correspondence. The writer presented it six weeks before the Los Angeles convention in an elaborate article in THE IRRIGATION AGE for September, 1893; he urged it again in the *Review of Reviews* for October last, two weeks before the convention. He sought by every means in his power to put the plan of commissions conspicuously before the public previous to the assembling of the congress. In the same spirit the writer has urged the public to await the reports of these commissions and to be prepared for a just compromise. This has been his constant expression in the pages of THE AGE, in official communications to the National Committee, in newspaper interviews and public speeches. There is not one small peg on which to hang a charge of bad faith against the author of the plan of commissions, either before, during or after the act of their creation by the International Irrigation Congress at Los Angeles last October. And the future will develop plans and purposes entirely consistent with the record of the past. There is no doubt but what the entire work of the national organization will command public approval when thoroughly understood.

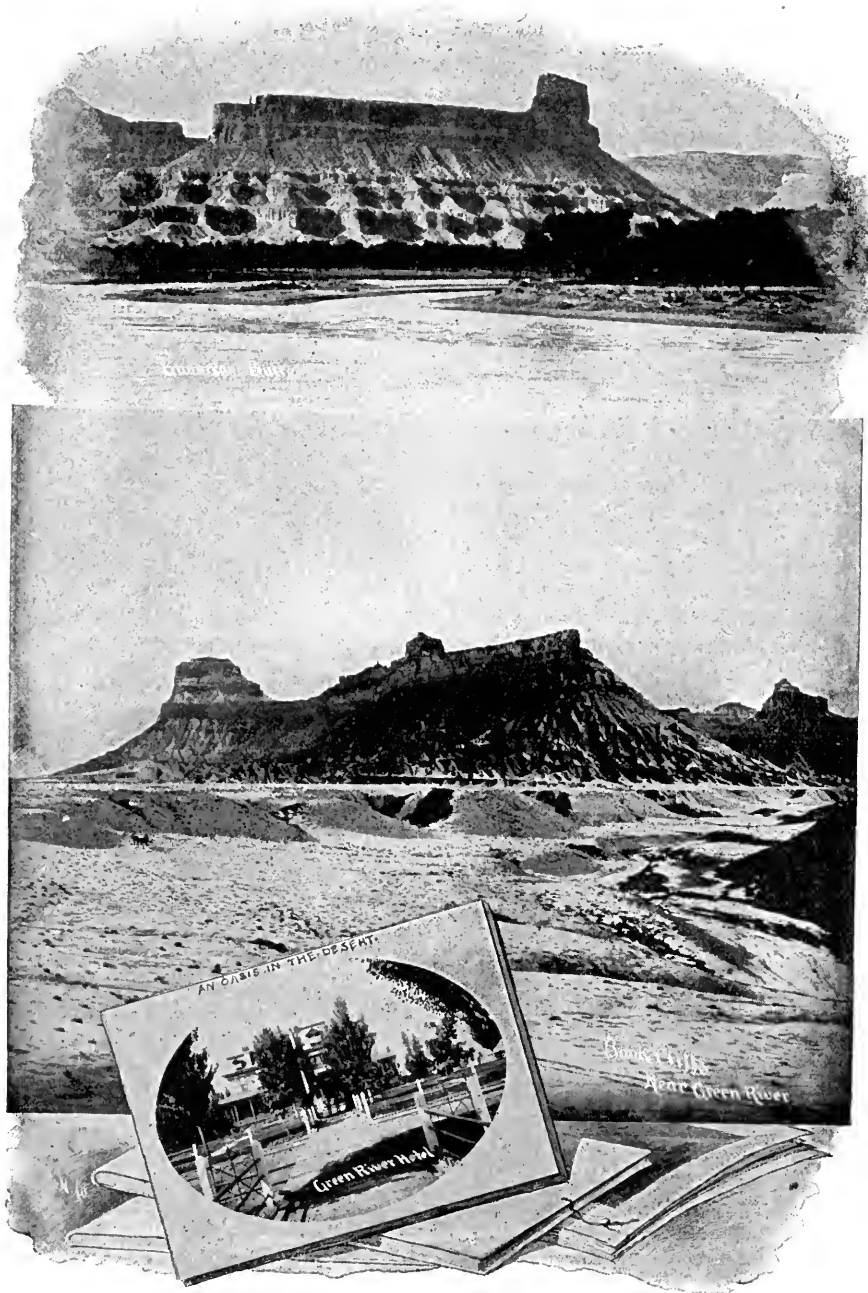


S. W. FERGUSON,

Of California, Manager of the Kern County Land Company.

Character of Land Enterprises. The announcement made in the last issue of this magazine to the effect that we would undertake to furnish intending investors with the facts about lands and securities offered for sale, has called out many letters of inquiry and considerable favorable comment. We have replied to several inquiries by mail during the past month as the promptest and most satisfactory method. Later these matters will be taken up for publication, when it can be done without needless injury to enterprises or individuals.

The Division of Inter-State Waters. Elwood Mead, the very competent State Engineer of Wyoming, contributes to this number of THE AGE a suggestive paper dealing with the division of inter-state streams. In the whole realm of unsolved western problems nothing else is at once so delicate and so important as the question of what to do with streams rising in one state and flowing through others to the sea. It is a significant and reassuring symptom that the discussion is opened by a citizen of Wyoming, to whom nature has given the headwaters of a number of important inter-state rivers, and to whom Congress has conceded absolute control over every stream flowing within its borders. If Wyoming, Colorado and Montana are willing to discuss the matter, the many States which now draw supplies from them will be



SCENES IN UTAH ON THE LINE OF THE RIO GRANDE WESTERN RAILWAY.

very glad to participate. Mr. Mead, in his present paper, confines himself to a statement of the difficulties which surround the problem, and of the importance of attempting its settlement without further delay. This will be one of the foremost topics at the next Irrigation Congress.

The article in the May number of this *"The Republic of Irrigation,"* entitled "The Republic of Irrigation," attracted wide attention throughout the country. It was the subject of newspaper comment in Boston and San Francisco and at many points between these two extremes. It called out many pleasant personal letters and the tenor of all that has been said is extremely favorable to the ideas which the article promulgated. The open letters to prominent Americans have also met with response. The following is an extract from a very encouraging letter from the distinguished author of "The Man Without a Country:"

Irrigation has interested me greatly ever since I have known anything about it, and the organization of emigration, which was the earliest public work I went into, as long ago as 1845, seems to me our most important home duty to this day. We ought to have some young Raleigh, or John Smith, or Miltiades, or Themistocles, who would start such a civilization as you propose.

EDWARD EVERETT HALE.

One of the most satisfactory responses *What Albert Shaw Says.* is that of the editor of the widely-circulated and very influential *Review of Reviews*. It is as follows:

To the Editor of THE IRRIGATION AGE: I have read nothing of late more inspiring than your presentation of the claims of Arid America. In the midst of the social and political unrest of the day and the general depression that has overtaken our industries, it is most encouraging to meet so irrepressible an optimist as the editor of THE IRRIGATION AGE, with his splendid prophecies and magnificent promises. Such a picture of possibilities as you have drawn helps us to see how transient after all must be the mood of national depression under the shadow of which we now languish, and quickens us to definite plans for the ever-brightening future. I believe heartily both in the possibility and the certainty of a much higher average of civilized life for the masses of the human family as the decades succeed one another, and am ready to believe that the great region to whose future you have pinned your faith may ultimately be the seat of a better and more prosperous social condition than the older countries. I can at least pledge you that the *Review of Reviews* will be at all times open to conviction, and more than ready to help the pioneers of the irrigation belt to make their claims known and read of all men.

With heartiest wishes for the continued success of your interesting and high-spirited journal, I am as ever,

Sincerely yours,

ALBERT SHAW.

Projects on the Rio Grande. What has already been done in the valley of the lower Rio Grande is a splendid inspiration for future achievement. There are several great projects on foot in this local-

ity, the most important of which proposes to reservoir the waters of the Rio Grande at Elephant Butte, consolidate all the rights on the river from that point to El Paso, bring the whole valley under a comprehensive system and vastly increase the area of land reclaimed. The project is a bold one, and is being vigorously prosecuted by enterprising citizens of El Paso. We are not sufficiently familiar with the details of the engineering and physical problems to express any opinion upon them, but there can be no question about the character of the country that can be created if the enterprise is carried to completion. No portion of the arid region presents more attractions for colonists, all things considered.

Some subscribers complain that THE *California and "The Age."* AGE deals too generously with California topics in view of the fact that there are sixteen other States and Territories in its western field. THE AGE has a very large circulation in California, as is natural, since the number of irrigators there is far in excess of the number in any other locality. For the same reason the industry there is in a very advanced stage, and hence is able to teach lessons of the utmost value to other localities. And yet a careful scrutiny of our pages for the past few months convinces us that California has not been accorded space at the expense of other sections. We are inclined to believe that these criticisms arise from the prominence of California in the advertising department. We should be glad to see the enterprising land companies a little more evenly distributed, and think this will be the case hereafter; but just at this time it happens that nearly all the active undertakings of this character are located in the Golden State. There are many others elsewhere nearly ready to come to the front.

Elsewhere in this issue is published an *Mr. Greene's Open Letter.* open letter addressed to the editor of

THE AGE by Mr. Charles W. Greene, formerly financial agent, president and manager of the Bear Valley Irrigation Company. It is written in reply to the article published last month, in which Bear Valley was treated as a type of irrigation investment. That article did not aim to ventilate the history of the famous California enterprise, and certainly not to praise or blame individuals. Mr. Greene's name was not mentioned in it. We attempt no answer to the open letter. We have admitted it rather than do even an unintentional injustice to Mr. Greene, whom we highly esteem as a man of brains and conscience. Just at this time the public is not deeply concerned with the personal aspect of the Bear Valley affair, however.

Official Call for Third National Irrigation Congress.

BY the authority of the National Executive Committee, the Third National Irrigation Congress is hereby called to meet in the city of Denver, Colorado, for the seven days beginning September 3d, 1894.

To the people of the western half of the United States this congress presents both an urgent duty and a supreme opportunity.

In this moment of extraordinary political, social and industrial unrest, the nation may well recall Macaulay's prediction, that the real test of our institutions would come with the exhaustion of our public domain. The nation faces that situation to-day, with all its perilous possibilities, unless the arid public lands are to be made fit for the homes of men. To suggest the means whereby this may be done, so that idle energies shall find employment and landless citizens find homes and industrial independence, is the duty and the opportunity of western men.

Irrigation Commissions in seventeen States and Territories, created by the last Irrigation Congress, will render reports to the convention at Denver. Upon these studies of existing conditions and future needs in all parts of the arid region it is proposed to construct a national policy and code of local laws to be submitted to the federal Congress and the legislatures of western States.

BASIS OF REPRESENTATION.

In accordance with a resolution adopted by the International Irrigation Congress at Los Angeles, California, October 14th, 1893, the Third National Irrigation Congress will be composed as follows.

1. All members of the National Executive Committee.
2. All members of State and Territorial Irrigation Commissions.
3. Two delegates at large and as many additional delegates as they have Congress districts, to be appointed by their respective governors for the following States and Territories: Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington and Wyoming.
4. Two delegates at large for each State and Territory not heretofore enumerated to be appointed by the governors of said States or Territories.
5. Duly accredited representatives of any foreign nation or colony, each member of the United States Senate and House of Representatives, each governor of a State or Territory, one member each from different societies of irrigation, of irrigation engineers, of agriculture, of horticulture, of chambers of commerce, of boards of trade, together with a delegate appointed by the mayor of each incorporated city of the seventeen States and Territories named as being directly interested in irrigation, will be admitted as honorary members.

By order of

THE NATIONAL EXECUTIVE COMMITTEE,

FRED L. ALLES, Secretary.

WILLIAM E. SMYTHE, Chairman.

Shall We Make History at Denver?



ARE the people of the Far West capable of rising to a great opportunity? Have they the genius and courage to grasp, at an opportune moment, the results of a generation by the work of a few hours, days or weeks? This question will only be answered when the results of the Third National Irrigation Congress are known. They can only be answered affirmatively by the presence of a large convention, of a convention properly representative of all the States and Territories, of a convention capable of realizing the importance of the work committed to it and willing to devote time, labor and thought in order to effect a great result.

THE NATURE OF THE OPPORTUNITY.

As indicated in the official call printed on the opposite page, the moment is opportune because the American people can no longer furnish homes unless the arid lands are reclaimed. We are living in the midst of critical times. Labor must be found for thousands of idle hands. Only five per cent. of our people own land. Some solution must be found for those social and industrial ills which are seeking loud and dangerous expression by various forms of political unrest.

But the very situation which seems full of danger to the Republic offers to the arid Western States and Territories a phenomenal opportunity. If they will come forward now with a comprehensive and practicable plan for the making of homes for millions in the West, they will lay the foundation for expansion and prosperity.

COMPLETING THE WORK BEGUN AT LOS ANGELES.

The Los Angeles Congress, in its five days' session last October, enunciated the fundamental principles of an irrigation philosophy. It then created the Irrigation Commissions, charging them to study the needs and ascertain the opinions of their various localities. It remains for the Congress at Denver to formulate a national policy and a code of local laws to be based upon the principles declared at Los Angeles and upon the reports of these State Commissions. Thus we have the material for good results. Whether we get them or not will depend upon the amount of brains, courage and devotion to duty represented at Denver.

WHAT IS NECESSARY FOR SUCCESS.

If every western reader of THE IRRIGATION AGE, every newspaper in the arid region, every member of National, Inter-State, State and County Organizations will unite in a supreme effort, the Congress at Denver will be a memorable success. In that case we shall make history as surely as it was made at Philadelphia in 1776. No popular convention in the annals of the American people has done more for human liberty and our country's material greatness than the Congress at Denver will do under these circumstances.

Let us highly resolve to make the most of the great opportunity!

AN UNSOLVED WESTERN PROBLEM.

THE DIVISION OF THE WATERS OF INTER-STATE STREAMS.

BY ELWOOD MEAD.

TWO reasons influenced the selection of this topic.

The first was the belief that the opinion of the irrigator at the head of the stream is always of interest to the user of water below. The second was the conviction that the division of water across State lines is destined to be a live question in the near future. As population increases and the area of land reclaimed is extended, the demands on some streams will exceed the supply, and parties living below the invisible barrier which the boundaries of a commonwealth interposes will seek some method of setting it aside. Already parties having investments on the lower levels of inter-state streams look with extreme and anxious disfavor on continued diversions across the border above them. A few controversies have already arisen in which the aid of the courts has been invoked, and the subject will inevitably become a disastrous source of litigation unless satisfactory methods of division can be secured. The settlement of interstate rights in the courts would be enormously expensive, and could not but prove unsatisfactory because the relief would be wholly inadequate. The division of water is not accomplished by a court decree. There must be in addition some administrative authority and action. When the floods come all users must be permitted to reap the benefit, and when they subside those entitled to the water must be protected in their rights. Nor are the courts the proper tribunal for the determination of the questions involved. The important problems, or rather the difficult ones, are not legal but physical. Any economical or satisfactory distribution of water must take into account the character of the discharge under original conditions and the modifications produced by use in irrigation. The duty of water, the losses from percolation and evaporation, must all be studied. Courts have no personal familiarity with this subject, and it will be little less than a calamity to intrust the important interest involved to the hazard of their decision. It is important, therefore, that those interested in this question give it early and careful consideration in order that when relief becomes imperative the method of procedure may be prepared. It is the aim of this paper to present some problems which confront the attempt to provide a system of supervision for inter-state streams.

These problems are both physical and political. They will be considered in the order of their statement.

In the first place the conditions of each stream should be carefully studied in order that the effect of diversions above on the volume below may be determined. A blind adherence to priority numbers is not the rule in state supervision and should not be in inter-state. The use of water in high level canals does not necessarily mean a loss to the users of water below. On the contrary it is, within certain limits, a marked advantage. It may, and unquestionably does, diminish the total discharge, but it at the same time increases the available supply. It holds back the spring floods when there is a surplus and augments, through percolation, the supply in seasons of scarcity.

The fluctuations in the discharge of the streams leaving the Rocky mountains do not coincide with the variations in the use of water for irrigation. There is a surplus early in the season and a shortage at the close. The area of land which these streams will serve is not determined by the discharge at flood time in June, but by the supply for July and August. This is fully appreciated in irrigated districts, but is not generally understood elsewhere. An examination of the gauging records of a number of inter-state streams shows that the average discharge for August is only from one-seventh to one-tenth that of June, while from one-third to one-fourth as much water is required for irrigation in the latter month as in the former. What is needed, therefore, is some provision for holding back the surplus of May and June for the period of scarcity later on. So long, therefore, as diversions above do not result in diminishing the discharge in the season of scarcity below what it would have been under original conditions, appropriators below cannot be considered as being injured, and this holds good under all conditions as regards priority of appropriation.

This fact is taken into account in the division of water within state lines. Subsequent appropriators living at the head of streams are encouraged to use all the water possible in the early part of the season, and in no case are the head gates of the upper ditches closed until the rights of prior claims below

make it an imperative necessity. The same policy should be pursued with inter-state rights, and when this is done it will be found, in many instances, that the evils which are anticipated have no existence in fact. From careful study, and I believe a thorough understanding of the situation, I am able to cite one instance: The North Platte river which flows from Colorado into Wyoming, and from Wyoming entirely across Nebraska. Here are three separate jurisdictions and each interested in making the greatest possible use of the common supply. Notwithstanding this, I am confident that no controversies will result. The limited opportunities for its diversion in Colorado and Wyoming will only result, if every diversion which natural conditions will permit is made, in both Wyoming and Colorado, in an increase rather than a loss to the available water supply below.

There are many such streams. Indeed, it holds true of all the principal rivers leaving Wyoming, but there are numerous instances where it is not the case.

On minor water courses, and on streams where the irrigable lands exceed the water supply, controversies are inevitable. The Arkansas in Colorado and Kansas, the Bear river in Utah, Wyoming and Idaho, are illustrations of streams that already are, or soon will be, over appropriated. Some provision for the registry and adjudication of all the rights to the water and for such measure of supervision across state lines as may be possible should be provided.

This brings up the political problems to be faced, and the first of these is the fact that in a considerable portion of the arid region such a thing as inter-state rights has no legal existence. There are no laws recognizing or defining such rights. There is no tribunal provided for their registry or adjudication, nor is there any body of executive officers to supervise the streams. Not only is there an entire absence of machinery for the proper registry and enforcement of such rights, but there is a further obstacle in the fact that the majority of the states of the arid region have expressly abrogated the doctrine of riparian rights, and in two of the states at least the ownership of the waters has been conferred by a specific grant of the National Assembly.

There is a further complication in the fact that there is no common basis in the laws of the different states by which the respective rights could be determined. In one respect only is there a uniformity as to the basis of rights to water. The doctrine that priority of appropriation gives the better right is very generally accepted, but the laws and practices of the states in construing the word "appropriation" vary so widely that it would be difficult, if not impossible, for two states to settle their respective claims by any mutual agreement. Wyoming, with its rigid

restrictions over grants of water, would not recognize as valid some of the liberal grants of neighboring states. Then, too, some states recognize what are known as preferred priorities. In Colorado and Idaho, for example, appropriations for domestic uses take precedence over those for irrigation, thus doing away with priority of use as a basis for the better right. In Utah there are primary and secondary appropriations, while in Wyoming and a number of other states, the doctrine that priority of time gives priority of right is subject to no conditions whatever, appropriations for all uses standing on an equal footing.

To harmonize these diverse customs and secure the acquiescence of these conflicting interests is a matter of no small moment. They are the general problems. There is one special one. The States of Wyoming and Colorado are the sources of the principal water supply of the Rocky mountain region. Both these States have in their constitutions an explicit declaration that the waters of the State are the property of the State. This declaration has been ratified and the grant confirmed by Congress. The national authorities have thus withdrawn their jurisdiction over this matter so far as those two states are concerned. It is now a question whether such jurisdiction can again be asserted. The citizens of those states have made large investments and appropriated the water under the secure conditions of the national grant, and it becomes an interesting question as to whether or not they can now be divested of its use and control. An extensive and complete system of supervision and control of these waters has been inaugurated as a part of the state government of each of these two states. Rights having great present and enormous prospective value have been established and confirmed under the laws and regulations of these two states and are rapidly acquiring that stability and security which only a lapse of time and the force of custom could give. It must not be expected that the people of these states will voluntarily surrender the control now exercised, or the advantages which their laws give them by virtue of their location. There is only one way in which this matter can be harmoniously adjusted, which is through a voluntary surrender of present privileges through the securing of compensating advantages in other directions.

In stating this I do not wish to be understood as regarding the present condition of affairs as in many respects desirable. Indeed, I regard the whole system of unlimited and uncontrolled appropriations a system in which the appropriators of Kansas have no means of knowing what is taking place in Colorado, or the appropriators of Nebraska of the work of their neighbors in Wyoming, is a grievous blunder. It is certain to lead to the construction of ditches for

which there is no water, and to the financial injury and personal hardship of many an honest toiler.

If there is to be any change, however, it must be wrought quickly because each year intensifies the insular feeling of each state and the rivalry felt towards its neighbor. It also renders the people of each state more contented with their local laws and customs, and less likely to accept any innovations or radical changes. In stating that there exists a sectional feeling and prejudice on the question of water I express what is either known to exist or which any attempt to introduce natural control will be sure to provoke. Indeed, the people of Wyoming believe that we have recently witnessed a very striking illustration of this feeling on the part of our eastern brethren. It will, I think, be admitted that the subject of irrigation is of greater consequence to Wyoming than to Kansas. The latter is a great agricultural state at present and will always be so should not an acre of its arid land be reclaimed. Wyoming is not at present self-supporting so far as agriculture is concerned, and there is no hope of her becoming so within the near future so long as the oppressive conditions of our present land laws remain in force. In Wyoming better agricultural conditions are an absolute necessity. Until we have them progress in other lines will be retarded. Less than one-tenth of the public land of this state is in the hands of private owners or contributes anything to the state's support in the way of taxation. Of the public lands by far the larger part are grazing lands. The value of these lands depends almost entirely on their being protected from being overstocked. Because of such overstocking large areas have already been seriously damaged, and in some sections the native pasturage has been practically ruined. The haste for present gain takes no heed of future consequences. The state suffers from a condition in which self-interest prompts the spoliation rather than the preservation of its resources. The opportunity to occupy the open range free of cost is also a sufficient incentive to secure abundant aid from outside sources. Flocks of sheep come from Oregon and herds of cattle from Texas to participate and hasten the destruction of one of the chief sources of the state's wealth and future prosperity. It is little better with our irrigable lands and with the water supply which is to reclaim them. Those who have studied the possibilities of the state know that what is needed is large, low, level canals, which can only be constructed through state aid, or through a land system which will permit of concerted action. At the present time the only development possible is that wrought by the individual settler, and the individual settler can only utilize opportunities which are within his means rather than those most to be desired. The state, having no control over the lands, can practi-

cally exercise no control over the construction of irrigation works. It has nothing to say as to how or where ditches are to be built. As the individual settler cannot divert the river, he goes up into the mountain until the rivulet is reached. Instead of one large canal there are hundreds of individual ditches. The water is wasted and lost in this multitude of channels by evaporation and percolation, and when used does not secure the best results because of the unfavorable climatic conditions. That we are building up such a system of works is not due to lack of appreciation of what we should have, or lack of knowledge of the best possibilities of the state, but it is simply a makeshift due to unreasonable and oppressive conditions fixed upon the state by the national land laws.

The people of this state, conscious of these evils and seeing no hope of securing national aid, instituted a movement for a cession of these lands to the state *in trust* in order that the state might control the construction of ditches, conserve the public water supplies, and in order that the gradual destruction of the vast areas of grazing lands might cease. The reception which this movement met with in remote sections of the country illustrates the force of the statement that no man can understand conditions he has not seen. Our friends in Kansas apparently saw nothing in this movement but an effort to absorb the entire water supply and thus work them an injury. We suddenly awoke to the fact that we were land grabbers and water monopolists. In fact, I cannot recall an opprobrious epithet which has not been visited upon the heads of the leaders in this movement. It has been useless for us to attempt to explain that monopoly of water was the farthest from our thought, or to endeavor to have it understood that so far as the water supply is concerned no movement could be more in the interest of the states below us. I am not saying in this that the cession of the lands is the best solution that can be devised, but I am saying what I know to be true, that the movement was instigated by a desire to relieve this section of evils which are not only retarding its progress but are working a direct injury to the other states interested in our water supplies; and to say further that the movement for our own relief carried with it no direct or indirect injury to other sections of this country. The hostility which it aroused was entirely due to a lack of knowledge of our conditions and of the evils which the movement was designed to remove. As a result we are going on in the old way. Parties are taking out ditches, without let or hindrance, wherever there is any water left in the streams, and as an illustration of how the interests of the states below us are being affected by this haphazard development I will give one incident of my official experi-

ence. A little over a year ago I made an examination of an important stream in a remote section of this state. Nothing had then been done to utilize its waters. Near its mouth is a great plain of about one hundred and fifty thousand acres. Three canals would have sufficed for its reclamation and would have practically absorbed the water of the entire stream. If the water had been thus used a large percentage of it would have returned as seepage and passed on to irrigators below. Under present conditions there was no means by which three large canals could be constructed. The work of development is a work for the individual settler. This form of development has since been rapid. There are now over forty individual ditches out of that stream, and before another season closes there will be more than double that number. I wish anyone who knows anything of irrigation to consider what that means, to consider the enormous loss from evaporation in that multitude of minor channels, the expense to which

the state will be subjected in the division of water, and the condition in which it leaves the interests of the people living in states below. More than one-half the water of this stream will be lost in passage through those individual ditches, while under a system of development which would have been pursued if this state had been in possession of its resources an equal percentage of the water would have passed on to the states below.

If we are to have a system of water laws for the arid region worthy of this country it must come through the exercise of mutual concessions and a disinterested recognition of the rights and possibilities of the respective commonwealths interested. It cannot succeed with imputations of bad faith and bad motives as a beginning. The thing that is most needed is a more general exchange of opinions and views and a more thorough understanding of the conditions and necessities of each section.

THE PUBLIC DOMAIN IN ITS SOCIAL ASPECT.

BY ARTHUR P. DAVIS.

THE public domain, as an outlet for our home-seeking millions, is practically exhausted, and has been for several years. It may appear that this statement is inconsistent with the fact that about 24,000 original homestead entries were made in the year 1893. Many of these entries were made on newly-opened Indian reservations, not previously subject to entry. A large number of them are by dummies acting for cattle and sheep grazers, desiring to extend control over their ranges. Another large number of entries has come under my observation, which are made on lands totally unfit for cultivation or for homes, where water for domestic use may be hauled many miles, and where no crop can be raised, on account of the rocky soil or arid climate. These lands are sparsely timbered with juniper or other scrubby growths, suitable for fire-wood, and it is to obtain this that the entries are made, and when cleared they are abandoned. Other tracts, too cold for farming, are taken for hay purposes, or for timber. There are other motives, both well and ill-considered, for filing on barren lands, but the fact remains that some entries are still made with the *bona fide* intention of establishing homes. The character of lands selected by those whose interest is to obtain the best there is, constitutes the surest criterion of the character of the remaining portion of the public domain.

The traveler in the mountains and deserts of the West is struck with the fact that every nook and corner that affords a few acres of arable land, and is accessible to domestic water supply, has been seized by the enterprising settler, who has gone resolutely to work to wrest a subsistence from the inhospitable soil and climate. It is very common to meet with the melancholy evidences of failure of these pathetic struggles for existence and independence on the part of some unfortunate family. The deserted cabin, the abandoned barley or potato patch, the decayed brush fences, are mute but eloquent deponents to the hopes, the privations, and the final disappointment of some who have returned to swell the ranks of those seeking employment in the towns and cities.

In the years 1886 and 1887 a large number of people, yielding to the pressure for land, and led on by one or two unusually rainy seasons and the glowing representations of land boomers, settled in the arid belt of the great plains, west of the 98th meridian. They built houses, barns and fences, and planted crops. One failure did not discourage them, but with a determination worthy of a better fate, most of them managed to pull through somehow, and to procure seed for another crop. A second failure discouraged many, and some of those with least faith, and who had the means, returned to more

promising vineyards. An occasional meager crop has sufficed to keep some still pegging hopefully away, many of them assisted by sympathizing friends, and by state or national charity. Some of the abandoned claims have been actually re-located, perhaps to be again deserted. The process of depopulation has continued ever since 1888, with very little interruption.

A comparison of the State census of 1887 with the national census of 1890 shows an increase of population in twenty-five counties, mostly in the eastern part of the state, and in all the other counties of the state, about eighty in number, a decrease is shown. In the western and especially the southwestern counties, this decrease is very great, amounting, in sixteen of the counties, to more than fifty per cent. In those counties showing a decrease, the total loss of population in the three years, was over 130,000, most of which took place between the census of 1888 and that of 1890. This illustrates for Kansas what took place on a similar scale in eastern Colorado, in Texas, Nebraska and the Dakotas. Whole districts have been depopulated; the frame buildings and fences have been removed or burned, but the sod houses and the abandoned roads showing evidences of having once been heavily traveled, still remain as witnesses to a departed civilization. This information closes with the year 1890, though the process of depopulation has been going on ever since. A letter to a professional man of Washington from Marena, Kansas, dated April 6, 1894, says:

* * * * * I would ask your valuable opinion as to the probability of our obtaining artesian water for the purposes of irrigation; for certain it is, that unless something occurs to assist the ordinary farmer, homes will continue to be abandoned, as many are already." * * * * *

We see, therefore, that the census furnishes merely a partial indication of the depopulation of western Kansas. The same influence that caused so many people to attempt to make homes in this region when it could not be done have caused, and are still causing the taking of lands in all parts of the arid region, on which a subsistence cannot be or can hardly be obtained, and this, as before remarked, is the best, possible evidence of the exhaustion of the once abundant supply of free homes. Large tracts of the arid region can be made habitable and productive by means of irrigation, but this costs money, and will not add to the area of free land.

The pressure for land was graphically illustrated by the scenes enacted on the opening of the Cherokee strip, where the applicants outnumbered the available tracts, five or six to one; where a vacant prairie at noon became before sundown a town of ten thousand inhabitants, and a hundred thousand home-seekers were turned away unrequited for their expenditure of money and effort.

This subject is one of great moment; for the exhaustion of the public domain marks a very important epoch in our national history, if not in the history of the world. Macaulay, the historian, writing to an American friend many years ago, said:

"Your fate I believe to be certain, though it is deferred by a physical cause. As long as you have a boundless extent of fertile and unoccupied land, your laboring population will be far more at ease than the laboring population of the Old World. But the time will come when New England will be as thickly populated as the crowded districts of the Old World. Wages will be as low, and will fluctuate as much with you as with us. You will have your Birminghams and Manchesters and in these Birminghams and Manchesters, hundreds of thousands of artisans will assuredly be sometimes out of work. Then your institutions will be fairly brought to the test."

Garfield said of that letter, "It startled me like an alarm bell at night." An examination of the history of this country, will, I think, vindicate the truth, not only of Macaulay's words, but of their prophetic implication. Ever since its birth, the United States has been periodically visited by financial panics of varying origin and severity, those of 1819, 1837 and 1857 being notable cases in point. As in all such cases, thousands of persons were thrown out of employment, but the abundant and fertile public domain so completely absorbed the surplus labor that the "problem of the unemployed" did not force itself on the attention of the country as it has done since, and business quickly resumed the even tenor of its way. The panic of 1873, however, demonstrated that the spell was broken. Though the tide of immigration again took up its hopeful way westward toward free land, and many new homes were established, the public domain was no longer able to meet the requirements, and the labor market was never entirely relieved. Within a few years after that date, nearly every state in the Union had passed a tramp law—an exotic that had no place upon American statute books, as near as I have been able to learn, prior to the year 1874, but which had long been in force in the Old World. The labor riots of 1877, and later, the constantly recurring strikes and business failures, bear testimony to the persistence of savage competition for existence which is tersely set forth in the following paragraph from the *New York Sun*, in 1888:

"The new Kings county elevated railroad wanted thirty engineers last week; but the applicants numbered over five hundred. It wanted thirty firemen; but the applicants numbered over one thousand. It wanted three hundred conductors, gatemen, ticket choppers, and other employees; but the applicants crowded the company's quarters for ten days. For many other branches of industry there are like reports. It is obvious that there is a large amount of surplus labor on the market.—*New York Sun*, April 23, 1888.

According to the census statistics for 1890, about five per cent. of the people of this country are land owners. With their families and personal dependents these comprise about one-fourth of our population,

leaving three-fourths entirely landless. Nature's edict to man is that he shall earn his bread by his labor. Since man is a land animal, it is only on land that his labor can be exerted, and a denial of access to land is equivalent to a sentence of death. We have, therefore, nearly fifty millions of people in the United States who have no legal right to existence, and can remain here only on sufferance of the rest. The interests of land owners as a class dictate that permission shall be granted to the landless to labor at the lowest rates at which, under the pressure of necessity, they will consent to do it. But the power to make them "get off the earth" remains unimpaired, and that this power is often exercised is attested by the fact that starvation does cut an important figure in statistics of mortality.

The following paragraph is from the Associated Press dispatches of less than a month ago:

NEW ORLEANS, March 28.—A dispatch from Sierra Blanca, describing the condition of the industrial army, states that when the army arrived there some of the men were so faint from hunger and exposure that they dropped in their tracks, and were picked up and carried to camp by their comrades. A beef and 400 pounds of flour were at once procured by the citizens of Sierra Blanca, which made one good meal. The men were so famished that their stomachs would not retain the food. Gen. Frye endeavored to get the men to leave on foot, but they could not walk owing to weakness. The dispatch further says that the men were gentlemanly, and that there are ministers, lawyers, merchants and mechanics among them.

Adjutant-General Allen, of California, with the consent of Governor Markham, issued last fall the following circular to the various regiments of the state:

"What is the condition of the arms of your regiment? How much ammunition is on hand? State the number of rounds. What is the cost of S. R. cartridges, 45 calibre? What are the standard weights powder ball and rifle cartridges? Has your regiment reloading tools? How many men are qualified for immediate service? What is needed? Reply promptly. The trouble will not come until January, after the fruit, hay and grain have been gathered, when an army of men will be out of employment."

It will be noticed that the men against whom these warlike preparations were made were not idlers, for he says there would be no danger as long as there was work to be had. They were industrious American citizens, who could become dangerous only after work had been denied them, and starvation gnawed at their vitals. They were men who loved law and order, but perhaps loved an emaciated wife or hunger-pinched child more than enthroned power.

Verily, Macaulay was right, and our institutions are undergoing their test.

So severe a test has never before been applied to the institutions of any country. The land systems of Europe developed with the people so slowly that the speculative element was very small, and therefore the incentive to hold land idle was small. Moreover, the people are less intelligent than ours, and in the belief that it is the divine will, are contented with a lower standard of living, and to eke out a mere animal existence upon donations from charity or to starve in silence—something the mass of Americans will never consent to do. Yet in spite of their ignorance, superstition and patience, the starving Europeans have sometimes brought the orgies of their oppressors to a sanguinary halt. The French revolution of 1789 is a ghastly and conspicuous example.

There is no possible way of keeping men long out of employment, except by denying them access to the natural opportunities for employment. And there is no conceivable method of permanently relieving the unemployed, except by allowing them access to land. We have here a vast empire, more productive than any similar area on the globe, which we have scarcely begun to scratch. A continent capable of supporting in ease and opulence at least twenty times its present population. We allow an insignificant fraction of our number, or of foreigners, to hold *unused* enough of the bounties of nature to furnish employment to the entire population of the globe, in order that they may reap the value imparted to the land by the growth and industry of the community.

To what purpose do we discuss the public land policy, if we are not to point out the effects flowing from it? If these effects are bad, is it not equally pertinent to suggest remedies? The diagnosis of a disease avails nothing, if we are to apply neither prevention nor cure.

The optimistic fatalism so fashionable to-day is apt to reply that the impending social cataclysm is certain to be averted by the good sense of the American people. That in their own good time, and before it is too late, they will discover and apply the remedy. I fully believe this myself, but not in the fatalistic sense. *We* are a part of the American people, and if such intelligent and patriotic persons as I see before me to-night do not propose to bestir themselves to studiously discover and industriously seek to apply the true remedy, how can we expect those less intelligent, who are harrassed with poverty, tormented with hunger, and pinched with cold to be more scientific and patriotic than we?

THE LAW OF WATER OWNERSHIP.

BY W. A. HANCOCK.

FOR the purposes of this article, it will be admitted that it is an elementary principle of law that air, light and water are the common property of mankind.

And, further, it will be admitted that the only method by which any private interest can be secured in water in the arid region of the United States is by prescription or by enactments—national, State or Territorial. If any rights for irrigating purposes in the arid region have been acquired by prescription, it is the result of appropriations made prior to the organization of the Territorial or State government.

In Arizona Territory the first legislature that was convened after the organization of the Territorial government declared that all rights in acequias and canals heretofore established should remain undisturbed; and further declared that the water of all lakes, ponds and streams of running water was public, and subject to appropriation for irrigation and other beneficial uses.¹

All, or nearly all, other Territories in the arid region enacted similar statutes. The States which have been organized from those Territories have, by their constitutions, declared that existing appropriations of water should be respected and maintained, and have further declared the unappropriated water of all lakes, ponds and running streams within their dominion to be the property of the public or the people, which are synonymous terms, and that it was subject to the use of the people.

That the right to appropriate it for beneficial purposes should never be denied.

These statutes have generally, if not in all cases, provided that the appropriator should have the exclusive control of whatever amount was appropriated, with the right to use, consume, lease, loan, sell and convey, subject always to the condition that it was for a beneficial use.

Whether the use was for a public or private benefit was not a material condition, nor was the right to be acquired by the appropriation, diversion and use of the water dependent, in any degree, upon such condition.

When once appropriated (and, in using this word, I mean legally in its fullest sense—by diversion and beneficial use), it remains within the control of the appropriator, his successors or assigns, so long as the beneficial use continues.²

He controls it, holds it as against all the world, is entitled to the use of it, and to all that may be made or realized from the use of it.

It is a commodity or possession that he may loan or sell, transfer and convey.³ His dominion over it is as complete and absolute as any other property, real or personal, of which the fee simple title is in him, so long as the beneficial use continues.

It is property in every legal aspect,⁴ and he will be protected in it by the courts in the same manner as in any other property.

The constitution of every State in the arid region declares that the title to the water already appropriated is in the appropriator, and that the title to the unappropriated water is in the State, the public, the people, and that this may be appropriated in the same manner, and when it is so appropriated the public lose all control of it; in other words, by appropriation the State is divested of it.⁵ Blackstone says that to "appropriate is to alienate". Webster says, to set apart for, or assign to, a particular person or use in exclusion to all others.

The statutes say, not that the right to the use of the water may be appropriated, but that the water may be appropriated.

The legislatures must have so interpreted the constitutions, because they have not enacted any laws for the control and management of different classes of water appropriations. The title of him who appropriated prior to the organization of the State, notwithstanding his rights and ownership are recognized by the State, is in no sense better, more complete or comprehensive than that of the subsequent appropriator. The hair-splitting question is, what does this ownership, this proprietary interest, this property right embrace? Is it the water or the right to the use of the water? If the appropriator owns the right to divert, carry, apply, consume and sell the water; if it is a property right that can pass by sale and transfer so as to give the purchaser the right to use, divert at a different place, convey in a different channel, and use in a different place so that it does not interfere with the rights of others, it must be a matter of indifference to him who owns the water.

There can be on the part of the original owner no assertion of any right or attribute pertaining to ownership after the legal appropriation has been accomplished, whether it be the State or all mankind.

The later decisions are recognizing the fact that the statutes confer on the appropriator of water an ownership in it, which, if it does not include the legal title, is equivalent to it, and it has been asserted by the supreme court of at least one State that the distinction (born of the elementary principle that water

is the common property of all mankind)⁶ attempted to be drawn between the title to water and the right to its use, is purely mythical and imaginary, and the sooner it is dropped and the two treated as identical, the better, and less confusion will exist.⁷

The right to appropriate water is not conferred on individuals alone, but upon corporations and associations, and what is said heretofore or hereafter in regard to the rights of individuals will also apply to corporations, and *vice versa*, for I hold that the person or the canal company that diverts the water is the appropriator.

The canal companies, whether associations or corporations, are not common carriers in any sense whatever, as claimed by some writers, and in some decisions of the courts.

The common carrier is one who for hire or reward undertakes to transport the goods of such as choose to employ him, from place to place.

The canal company that constructs its canals and diverts the water from the natural stream, intending to convey it to the consumer, cannot, from the very nature of the business, be a common carrier. The water to be diverted is not the property of the consumer until it is delivered to him.

The water is not delivered by the consumer to the canal company for transportation. The contrary must be the case to constitute the canal company a common carrier in any sense whatever.⁸

The consumer does not divert the water from the natural streams and has no interest in the diversion or the means of diversion as an individual, and consequently he has no proprietary interest in the diversion.

The water can only be appropriated from the natural streams. The person or company that makes the diversion for the beneficial use is the appropriator, and if the water is so diverted in order to be supplied to the consumers, it is for a beneficial purpose.⁹

Under the present statutes of the United States,¹⁰ and the States, dams may be constructed, and the water impounded and held for future use.

In other words, it may be hoarded from the general public for the benefit of the company and delivered to its patrons, when it can be done advantageously to the company and the consumers. Under the beneficent provisions of the law, the company may expend a large amount of money in constructing its dams and canals, with the hope of large gains.

Having acquired the right to hold and transport the water to the consumers to the extent that it finds consumers for a beneficial use, it may sell or lease it to the consumers at such rates as the company and the consumer may agree upon. The rates are subject to legislative control, but rarely, if ever, have the

rates been so unreasonable as to invoke such interference.

To fix extortionate rates would be to defeat the objects of the company. The success of an irrigation enterprise must depend upon the success of the consumers of the water. To impose upon the farmers under the canal water rates so excessive as to make farming unprofitable would result in dismal failure to the supplying company as well as the consumer. No general standard of fair and reasonable rates can be established. What would be equitable and reasonable for the consumer in one locality would be extortionate in another. So what would be equitable and reasonable for one company would not pay a reasonable interest on the investment of another company. The method of doing its business is, of course, at the option of the company. It may loan or sell its water rights or privileges and it may lease or sell the water it supplies.

The practice of selling floating water rights adopted by some companies as an expedient for raising money is open to criticism and should be discouraged. It opens the door (and there should be none) to speculation in privileges. If a company desires to keep itself free from harrassing litigation, its methods of business should be such that all consumers shall enjoy the same privileges at the same price.

As before stated, the consumer taking water from the canal of another cannot make an appropriation.¹¹ Consumers have only such rights as they have acquired by contract, purchase or lease from the company that appropriates and supplies the water.¹² Hence there exists no priority of right to the water from the canal between the consumers.

Could any other construction be placed upon the statutes it would very seriously affect the value of property invested in canals and reservoirs, and would lead to much confusion and possibly to annoying litigation.

NOTES.

1. Revised Statutes of Arizona, page 558, Secs. 1, 2, 3, 25 and 27.

2. The appropriator becomes the proprietor of the water, or the use of the water (it is immaterial which term is used, they are in effect the same), and he remains the owner of the use so long as the beneficial use to which it was appropriated is continued.

Wyatt v. Larimer & Wild Irrigation Co., 27 Pac. Rep. page 906.

3. He has property in a commodity, that he can deal with, transfer and deliver to the consumer or user.

I. D. pages 911 and 913.

The right to water acquired by appropriation may be transferred like other property.

McDonald v. Bear R. Co., 13 Cala. 220.

The owner of the ditch has the exclusive power to control, and right of enjoyment of the water diverted by and flowing in his ditch; but whether such water be his private property it is not necessary to decide.

Kidd v. Laird, 15 Cala. 162.

Water when collected in reservoirs and pipes, and thus separated from the original source of supply, is personal property, and is as much the subject of sale, an article of commerce as other goods and merchandise.

29 Pac. Rep., pages 911 and 913.

4. While it so remains the subject of exclusive ownership and control, it is the property of the appropriator in every legal aspect.

Id. page 910.

26 Pac. Rep., page 313.

5. By such appropriation and by reason of the diversion and separation of the water from the volume of the stream, the title of the public or the people was divested, and the appropriator became the owner. Cleared of all embarrassment by reason of the supposed double ownership, we find the rights declared in the constitution to be the same that were recognized before its adoption.

29 Pac. Rep., page 911.

6. Wyatt v. Larrimer & Weld Irrigation Company, 29 Pac. Rep., pages 912 and 913.

7. Id., page 913.

8. These definitions are so elementary that they would not be stated, except for purposes of illustration, to show that in the case presented the corporation is not brought within the definition, in any respect, of either a "common" or "private" carrier, coming nearer the definition of "private" than "common" carrier, but lacking several indispensable elements of either.

In order to constitute a carrier of either class, (1) the goods to be carried must be the property of the bailor. (2) The thing must be delivered by the bailor to the carrier to be transported. (3) The carrier must transport and deliver to the consignee the identical goods delivered to him for transportation. (4) A person who contracts to transport and deliver to another at a given place a certain portion of a common lot of material, to be separated from it at the place of the consumer, to which the consumer had no title prior to the transportation and delivery, is in no sense a carrier, but a vendor of the commodity.

Wyatt v. Larrimer & Weld Irrigation Company, 29 Pac. Rep., page 909.

9. The canal company, the appropriator, has a proprietary right to the water diverted.

Id., page 911.

10. Act of Congress entitled, An Act to repeal Timber Culture laws, and for other purposes.

Approved March 3, 1891.

11. The constitution recognizes priorities only among those taking water from natural streams.

Reservoir Co. v. Southworth.

21 Pac. Rep., page 1028.

29 Pac. Rep., page 912.

12. That the rights of the complainants to equitable relief must depend solely upon the contracts made by them with the company.

29 Pac. Rep., 913.

THE CATASTROPHE AT LIMA, MONTANA.

BY J. M. GOODWIN.

THE sudden emptyings of reservoirs in Idaho and Montana lately should teach some very important lessons if the facts and conditions are properly studied and heeded. It has been shown that the flood in Idaho, in March last, by the breaking of the dam came from inferior construction with unfit materials and in which case the dam was washed out. In early May a very different problem was presented in the case of the emptying of the reservoir belonging to the Lima, Montana, company where the dam was left intact. While the flood was quite disastrous in covering lands with debris, washing away of soil from fields and flooding lands and buildings, the losses from these causes alone were not very great. The valleys of Red Rock and Beaverhead were wide enough to permit the water to spread out and hold back the torrents to such an extent as to make the progress of the flood downstream very slow. It is doubtful if there is a more enticing place in all the country for throwing a dam across a stream to secure a great storage reservoir than was the one selected by the company that put in the dam twelve miles above Lima. It was in a deep, narrow canyon, requiring a short dam and which was easily constructed with material on each side. On the left hand side the hill rose abruptly

from the water and it was a solid mass of conglomerate held by nature's own and best cement. On the opposite side the hill was made up of gravel, boulders, sand, etc., much stratified, being all secondary deposit, or "wash," and of ample strength to hold back the water in the reservoir had it not been unwisely cut. While that was really the weak point in structure it would have stood more than the pressure alone, and which did not cause its destruction, as will be shown later. These hill sides hedging in the stream were covered with brush, all of which was rooted out and burned, leaving the surfaces in good condition for putting in the earth and stone work of the dam. At the bottom of the stream the space between walls was only fifty feet, while forty feet up it was 110 feet. A trench fourteen feet wide and fourteen feet deep was sunk clear across this space of fifty feet and masonry of stone and Portland cement put in having sixteen feet base and tapering to six feet at the top, a point ten feet below the top of the dam. This wall was bounded with the hill on each side and formed the core of the dam, the main structure being earthwork. Transversely the dam had a base 300 feet wide while the center on top was forty feet wide, the two slopes having a rise of one foot in

two and a half feet horizontally. These slopes were well-protected by a covering of stone eighteen inches thick.

The discharge into the canal system to be inaugurated hereafter was through a tunnel 7x7 feet and 176 feet long cut through very hard conglomerate, making the cutting of it very difficult and expensive. This conglomerate had fissures in it, and these in connection with a body of dolomite, which swelled badly in getting wet, caused a little caving inside of the tunnel and throwing down some obstructions to the free flow of water. The tunnel should have been lined inside to make it secure and give free flow of water. This tunnel had a capacity of 1,500 cubic feet of water per minute under the proposed pressure in the reservoir.

The company selected the right hand side, some distance from the dam, for a spillway to carry off surplus water to keep it down to a safe level. That appears to have been simply an open cut in the ground, all of which was secondary deposit, and to have been an insecure affair should any great body of water run through. Citizens in the valleys below became afraid the dam would wash out and serious losses follow. Such a hubbub was raised over the dam and what they deemed impending dangers, which were so thoroughly talked over as to excite citizens, that an agreement was finally entered into by which a few citizens and the county of Beaverhead were to contribute enough to put in a new and larger spillway. Only two of the board of directors were residents of the state, and they for their part agreed for the work to be done and to waive all claims for damages they might sustain. This new spillway was to be some distance farther in the hill, and to be cut to a certain depth, 30 feet wide at the bottom, and with a grade of one per cent., and it requires a cutting about 350 feet long. The work was done by a contractor under the guidance of J. H. Haines, sheriff of Madison county, the dam being in that county. Mr. Haines was not an interested party further than to carry out the wishes of the people. He was not a civil engineer, and pleaded ignorance of hydraulics, but he did the best he knew how, and no one blames him in the least for what afterwards happened.

It is safe to say no good hydraulic engineer would ever have constructed a waste weir as this one was. The earth to be cut through was made up entirely with secondary deposit, and this was in layers in succession of hardpan or cemented gravel, sand, boulders, etc. These layers had a dip up stream of seven to ten degrees, while the cut was to have its bottom pitch the other way one per cent. Necessarily with this grade and the head high up made a fall of 30 to 40 feet at its lower end or discharge, enough to rapidly tear away the earth and make the plunge work up stream at a greater or less speed. Had

some of the streaks of hardpan pitched the other way and been used for the bottom of this spillway it might have carried a stream indefinitely. But its weak point was in having the underlying stratas dissolved and washed away, leaving the streaks of hardpan to fall from pressure and lack of support below section after section until it had washed clear back to the water, and thus emptied the reservoir with a great rush of waters. Nature has recorded in its history of rocks the fact that Niagara Falls has gone up stream many miles through the waters in the big plunge, softening and washing out the softer materials beneath the rocks, leaving them to gradually split off and fall from their own weight and that of the water running over them, then to be pulped by the "mills of the gods" and carried away.

In the Lima dam we have the spectacle of that structure as firm as ever, while off to the right is a chasm 150 feet wide, 50 feet deep and 500 or 600 feet long, from which the floods carried out from 1,500,000 to 2,000,000 cubic feet of earth, the boulders, gravel and heavier portions finding lodgment below, while all there has been greatly changed in appearance.

The beautiful grassy bottom of a few hundred acres a few weeks ago is now ruined, while the creek flows in two streams, one each side, instead of in the old channel now filled up.

If, in construction, a good headgate of masonry had been put in, and a solid flume for the surplus water to run through clear down to the creek level, there would have been no washout and no flood, and the company would not now have a chasm more difficult to dam than was the one now standing firm.

This dam was intended to hold back and reservoir the rainfall of a drainage basin 100 miles long by 80 miles wide. The reservoir was filled to within eight feet of the top of the dam when the waters broke loose, and it extended up stream about 15 miles, averaging one mile wide. What the plans of the company are for the future is not known. Where the responsibility for this flood and resulting damages rests is likely to be determined in the courts. Certainly there are rights in equity which will be contested for, and which the writer does not care to discuss. If it results in a failure of the irrigation enterprise to cover the beautiful valleys below, it will be bad. But the lesson it has given should prompt such State laws as will forever prevent as far as possible the recurrence of any similar future catastrophe. This company capitalized at \$500,000, incorporated under the laws of Montana, and it is time there should be laws governing and controlling such enterprises to at least the point of safety to the people, as well as defining rights in equity for both the people and companies, and such laws should embrace the services for the State of one or more competent hydraulic engineers.

IRRIGATION IN THE CANADIAN NORTHWEST.

BY CHAS. W. PETERSON.

THE question of irrigation in the Canadian Northwest is one which is at present engaging the attention of all thinking men interested in the agricultural or pastoral industries in the semi-arid portion of these Territories. Numerous applications for irrigation charters have already been presented to the Dominion Parliament, and two companies have actually commenced work, viz., the "Calgary Irrigation Company" and the "Calgary Hydraulic Company."

Until a comparatively recent period the scheme of rendering the semi-arid district of the Northwest Territories productive by means of artificial watering was practically unknown, and great praise is due Mr. William Pearce, superintendent of Dominion mines, for his untiring efforts during the last few years in bringing the subject to the attention of the ranching population and others interested, as well as the Department of the Interior, which is entrusted with the administration of the public lands in the Territories and consequently the most extensive land owner. Valuable aid in this cause has also been indirectly given by the members of the Mormon settlement in Southern Alberta. These people, being the pioneer irrigators of the Northwest, have clearly demonstrated the capabilities of our soil under the influence of irrigation, and the results of artificial watering have proved so complete a revelation to those unacquainted with this method of agriculture, which unfortunately constitutes the large majority in this as in most other communities, that any prejudice they may previously have entertained against the same has been easily removed, and many of them are now the most enthusiastic believers in utilizing the great body of water emanating from the east slope of the Rocky mountains for the artificial watering of our extensive plains.

Roughly speaking, the area which could be profitably irrigated wherever the natural conditions allow of the same, may be computed at 67,000 square miles, being the district between the Rocky mountains and the eastern limit of the Missouri Couteau, the international boundary on the south, and township 30 on the north. Although this district could hardly be designated "arid" in the true sense of the word, as considerable farming is at present being done within its boundaries, it cannot be denied that agricultural operations can only be carried on with results extremely problematical, and would in most years, if not invariably, be infinitely more advantageous if a sufficient water supply was insured, thus

affording protection against the only formidable drawback that is likely to interfere with the successful results of the settler's labor. The hay meadows where the large ranchers obtained their winter feed are also to a large extent either drying up or being appropriated by settlers under the homestead regulations, and the result is that the ranchers are beginning to realize that artificial means will have to be resorted to in order to keep up their necessary hay supply. Add to this the fact that the natural dip of the surface and other most favorable conditions, such as an abundant water supply, rendering it possible to irrigate the irrigable lands within the district mentioned, at an extremely low cost compared to other countries, it is hardly to be wondered at that so much enthusiasm should be displayed by everybody interested, and who is not interested, that has his home here, in the development of the country.

There are at present numerous private schemes at work and several under construction and contemplation and with such object lessons as these will afford continually before them, the education of the community to the utilization of the large volume of water contained in our rivers and streams and at present running to waste, promises to be the work of a comparatively short time, as one could hardly fail to realize the immense advantages which could be derived from the judicious application of these waters upon the meadows and cultivated fields.

The Calgary Irrigation Company draws its water supply from a point on the Elbow river some twelve miles west of Calgary; the main ditch follows the course of that river some short distance to the south of it in an easterly direction and enters the city of Calgary. Mr. Wm. Pearce is the president of the company. It is anticipated that some 50,000, and by making very few extensions 100,000 acres could be brought under water from this ditch. The head works and part of the ditch have already been constructed, and it is the intention to complete the construction of the same this season if possible.

The head works of the Calgary Hydraulic Company are situated near Keith Station on the Bow river; the ditch follows the main line of the Canadian Pacific railway, crosses the Bow river and approaches Calgary on the north side. Mr. George Alexander is the president of this company.

Both these companies being under the most energetic and experienced management will doubtless

attract the attention of ample capital to carry their ventures to a successful issue, as one can hardly conceive of a more secure and profitable investment for private capital.

In the Draft Irrigation Act to be laid before Parliament at Ottawa during the present session, the first important step has been taken towards facilitating irrigation operations in the Northwest Territories, and, judging from the interest which has been exhibited by the settlers in the semi-arid district of these Territories in the matter, it is evident that they are keenly alive to the importance of legislation being provided while this vast district is as yet in its infancy; the preparation of this act has been entrusted to the most able men available, and expressions of opinion and criticisms have been invited and freely given on the subject of alterations and additions to the proposed act by a number of parties directly interested; valuable material has, of course, also been gathered from the experience of similar enactments in the United States. Several irrigation conventions have also been held recently throughout the Territories, chiefly with a view to discussing the proposed act, and it is to be hoped that in the interest of irrigation, the same will become law in the near

future. A delegation composed of representatives from the various irrigation leagues established in this district are at present on their way to Ottawa to press the passage of the act and also to make representations to the Dominion Government as to the necessity of having a reconnaissance survey made of the semi-arid district, with a view to the reservation of reservoir sites, etc., at the earliest possible date in order that these reservations may be made before vested interests have to be considered in giving effect to the same.

It is impossible to estimate the advantages of extensive irrigation schemes in this part of the Northwest Territories, so bountifully favored by nature in every other way, both as a means of attracting a desirable class of settlers to take up their abodes on our fertile lands and of improving the condition of those already settled here. Experience has shown what transformation has taken place in the arid regions of the United States since the general adoption of irrigation in localities subject to drought, and it is to be hoped that the enterprising settlers of the Canadian Northwest, or at least those parts where irrigation might be advantageously introduced, will profit thereby and "go and do likewise".

GRAND VALLEY, COLORADO.

THE total amount of land lying in Grand Valley immediately surrounding Grand Junction that is capable of being irrigated is about 120,000 acres. Of this amount 35,000 acres are watered by the Grand Valley Irrigation Company's system of canals, the head of which taps the Grand river twelve miles east of the city and extends through the valley to a point about fifteen miles northwesterly from the city. This canal was built in 1883-4, and it is under this system that most of the farming and fruit growing is done at present. This system consists of seventy-six miles of canals and laterals and has a capacity of about 600 second feet. The south bank of Grand river for some distance above and below Grand Junction is a perpendicular bluff from 75 to 150 feet high. On this bluff lies some of the choicest fruit and garden land of the valley. It has been found cheaper to water this land with pumps run by the power obtained from the falls or rapids in the river than by gravity ditches. There are at present four of these plants in successful operation; the Oasis fruit farm plant owned by Geo. P. & Jas. H. Smith, watering 480 acres. Over 100 acres of their orchard will bear fruit this year. The Grand Junction Orchard Mesa Land Company's plant watering about 800 acres. About 300 acres of their orchards will bear this year. This plant was built by Charles N. Cox, who is the present manager. The plant built by A. B. & W. R. Johnson & Silas Wilson, watering about 1,000 acres. These three plants are on what is known as Orchard Mesa. The fourth is the Mt. Lincoln Land and Water Company's plant, situated at the mouth of the canyon 14 miles east of the city. It has a capacity at present of about 1,500 acres. Surveys have been made for a high line canal to take water from the Grand river in the canyon east of the city and skirting the foot hills and covering about 75,000 acres

above the present Grand Valley canal. The Western Colorado Development Company have secured about 6,000 acres of choice land on Orchard Mesa which they propose to water by means of water (living and snow water) stored in reservoirs on Grand Mesa, and by means of a pumping plant placed near the mouth of the canyon at the upper end of the valley. This company has one of the most favorable sites for a power plant on the river. Considerable construction work has already been done on this system. Surveys have been made and some construction work done upon another pumping plant to water about 3,500 acres of land on Red Mesa across the river from Grand Junction and below the mouth of the Gunnison. The power for this plant is to be obtained by means of a canal from the Gunnison river opposite the city extending to a point about one and one-half miles west of the city when a head of twenty-one feet is obtained. In view of the rapid advancement of the application of electricity to domestic uses (heating, lighting and cooking) and for the transmission of power, it is easy to foresee the important part this immense water power, stored at these various plants, will play in the development of our city and valley. All of the plants mentioned can be increased to a capacity many times greater than what is required for their present purpose, pumping water for irrigation. Our valley is rapidly being cut into small farms from ten to eighty acres; the average will perhaps be forty acres. With this thickly settled community electric railroads will be run up and down the valley, and many of our country homes will be using electricity for light and for cooking. These features, together with what has already been demonstrated—our fruit growing possibilities, our excellent climate, etc.—should make this valley a very attractive field for the homeseeker and the investor.

TALKS WITH PRACTICAL IRRIGATORS.

IRRIGATION PROGRESS IN AUSTRALIA.

A FORMIDABLE competitor to the American farmer and orchardist is rapidly developing in Australia. On the foundation stone of irrigation the Australians are rearing a gigantic industrial fabric, destined to make a deep impression upon the world. Already they are producing large quantities of choice fruit and placing some of it in the British markets in competition with the best efforts thus far made by the successful orchardists of California and New England. Tasmanian apples stand high in the London markets, and the dried apricots of the Murray river region are reported to excel in quality, so far as the British markets may be allowed to judge, the best sent over there from the United States. But all this is being developed from a region in almost every way similar to the arid region of the United States; and those who doubt the ability of irrigation to work the same wonders here as there may possibly imbibe some degree of inspiration from the following citation from a late number of the *Australian Agriculturist*:

"Step by step the great Australian interior is being invaded, and he would be a bold man who would say where the movement is to stop. The old idea of the land was a coast and a river-side strip of habitable territory and beyond it the great Australian desert. All this is being changed, however. Every successful artesian well marks the site of an advanced post into the forbidden land."

Irrigation by means of artesian wells, or "bores" as they are called in Australia, is rapidly on the increase in that country as well as in various parts of the United States. They have even gone so far as to bore wells for the purpose of irrigating the sheep pastures in Australia, and it is hoped and expected to very greatly increase the wool clip of the colony by this means. Enormous as the sheep interests now are in that far-off corner of the world, (the number of sheep being given at 130,000,000) it is expected soon to vastly augment the product of both wool and mutton by securing better pasturage through systems of irrigation so generally felt to be desirable and necessary. So sanguine are some of the best informed men of the countless benefits to flow with the waters of irrigation that they allege the time is not far away when, through the numerous systems of irrigation sooner or later to be established in the interior of the

continent, many hundreds of bales of wool will be grown then where one is now produced. But not only is the wool interest and the mutton interest to be thus developed, but the fruit industries will receive a phenomenal development also, as well as all the collateral activities dependent thereon. The fact is that the modern world is just awakening to the possibilities of irrigation, and a new agriculture and horticulture are building up around us. In India, in Egypt, in Argentina, in Australia and Mexico, as well as in the United States, the spirit of progress in irrigation is abroad; and we Americans are quite likely to be distanced in this race unless we take hold of the great problem as presented by the arid belt of Western America, and work it out upon its merits, along the lines of a broad and comprehensive statesmanship, unhampered by local jealousies and unchecked by sectional or partisan rancor. The opportunity of the century is now before us to lay the foundations broad and deep, of the mightiest and fairest structure of modern times—the great fabric of irrigation as exemplified upon millions of small, intensely cultivated farms, the homes of millions upon millions of happy and contented citizens. All this is no figment of the imagination merely, but an easy possibility within the grasp of the present younger generation of American voters. Shall it be realized? An affirmative answer must depend upon the enterprise, persistence, honesty of purpose and untiring perseverance of the men of Arid America.

DOES FARMING PAY?

Does farming pay? is a question always on the lips of the men hunting for facts to sustain their theories, or of others seeking theories to account for facts.

It is very hard to arrive at a comprehensive and truthful answer to the general question. It depends upon so many conditions that, as a matter of fact, in its present stage of development, agriculture has come to be regarded by many as the least profitable of the great occupations of men. Markets are uncertain and prices low; but were producers better able to control the conditions of production, as regards the supply of moisture, the whole phase of American agriculture would be changed in one season. Irrigation farming does pay, and will continue to pay good profits when dry land husbandry will have been driven to the wall.

MACHINERY VERSUS MAN AND HORSE POWER.

Mr. Carrol D. Wright, the eminent government statistician, has made an exhaustive compilation showing the amount of steam and water power by which the mechanical industries of this country are carried on. His figures prove conclusively that, even if machinery of one kind or another has displaced a great deal of hand labor, it would be wholly impossible for the mechanical industries to go on without the power derived otherwise than from men and animals. He says:

"The mechanical industries of the United States are carried on by steam and water power representing, in round numbers, 3,500,000 horse power, each horse power equaling the muscular labor of six men; that is to say, if men were employed to furnish the power to carry on the industries of this country, it would require 21,000,000 men, and 21,000,000 men represent a population, according to the ratio of the census of 1880, of 105,000,000. The industries are now carried on by 4,000,000 persons, in round numbers, representing a population of 20,000,000 only. There are in the United States 28,600 locomotives. To do the work of these locomotives upon the existing common roads of the country and the equivalent of that which has been done upon the railroads the past year would require in round numbers 54,000,000 horses and 13,500,000 men. The work is now done, so far as men are concerned, by 250,000, representing a population of 1,250,000, while the population required for the number of men necessary to do the work with horses would be 67,500,000. To do the work now accomplished by power and power machinery in our mechanical industries and upon our railroads would require men representing a population of 172,500,000, in addition to the present population of the country of 65,000,000, or a total population, with hand processes and with horse power, of 227,500,000, which population would be obliged to subsist on present means. In an economic view the cost to the country would be enormous. The present cost of operating the railroads of the country with steam power is, in round numbers, \$502,600,000 per annum; but to carry on the same amount of work with men and horses would cost the country \$11,308,500,000."

SAVE THE MANURE.

Good farmers everywhere are careful to preserve their stable manures, and allow as little waste as possible. One of the most valuable ingredients of all stable manures is ammonia, and special care should be taken lest this substance be lost by volatilization. Ordinarily, it must be confessed, a large part of the value of farm yard manures is lost through lack of care in this respect. Some farmers mix lime with their stable manures, believing that it will fix the ammonia in the manure, and thus prevent the loss of nitrogen. This is largely an error. While lime acts well as deodorizer, its value in preventing the escape of ammonia is really small. The most valuable and easily procured substance to use for this purpose is land plaster or gypsum. Its cost is often but \$4 or \$5 per ton, and if it be freely mixed with stable manure by being thrown into the stalls and upon heaps of refuse, the effect will always be found salutary and profitable. It should be remembered, too, that the

urine of animals is especially rich in essentials of plant food, and that the nitrogenous ingredients are best preserved by the use of gypsum in absorbing the urine in the stalls. Gypsum is of the greatest advantage, too, if used freely in reclaiming alkali soils so often found throughout the arid regions. It should not be understood that gypsum is valuable only as a fixer of ammonia in animal excreta, for if applied to almost any crop on any kind of soil the effect is good. Particularly, however, is it valuable on sandy soils; and corn or wheat fields which have received a dressing or two of gypsum may be easily distinguished by their stronger growth from fields to which no plaster was applied. There are immense deposits of gypsum in a number of places in the arid belt, and doubtless others will in time be discovered and developed. All such deposits which are available should be worked, and they will be found a source of great revenue to any section of the country making full use of them. A dressing of gypsum in early spring is highly recommended to stock pastures, especially of clover. Many good farmers also apply it later in the season, and believe it assists very greatly in carrying pastures through seasons of prolonged drouth. A handful of gypsum is often thrown about a hill of corn soon after the young shoots appear above ground. The effect is to stimulate the growth and to give the leaves a dark, rich color.

THE "WOOLLY" WEST.

From a volume of facts and figures regarding wool and its manufacture sent out by the Bureau of Statistics of the Treasury Department, we learn that about one-fourth of all the wool produced in the world comes from Australasia. The London Board of Trade gives the world's product of wool in 1860 at 955,000,000 pounds; 1870, 1,295,000,000 pounds; 1880, 1,626,000,000 pounds; and in 1889, 1,950,000,000 pounds. The following table shows the production of the various countries contributing to the world's output:

	Pounds.
United Kingdom.....	134,000,000
Continent of Europe.....	450,000,000
North America.....	330,000,000
Australasia	450,000,000
Cape of Good Hope.....	70,000,000
River Plata, S. A.....	360,000,000
Other Countries.....	156,000,000
Total.....	1,950,000,000

In 1890 the wool clip of the United States amounted to 276,000,000 pounds, of which 85,605,617 pounds were produced east of the Mississippi river, and 190,394,383 pounds west of that line. It is interesting in

this connection to note the westward march of the sheep industry since 1840. In that year the States east of the Mississippi held 97.4 per cent. of the total number of sheep in the United States, and produced 98 per cent. of all the wool. But in 1890 only 38.3 per cent. of the sheep were found east of the Mississippi, and but 31 per cent. of the wool clip. Thus in 1840 the number of sheep in the East was 18,807,779, and those in the West numbered but 503,595, while in 1890 the conditions were reversed, and we find 27,347,631 sheep west of the Mississippi, and but 16,988,441 to the eastward of that stream. A large proportion of the sheep in the West are grazed on the arid lands, and some flock masters have been so short-sighted as to oppose irrigation enterprises for the reason that when the land is rendered arable by irrigation, the free range for sheep would be curtailed. But it must be entirely clear to every intelligent man that one acre of land properly watered and cultivated will produce more forage for sheep or other stock than a hundred acres in its present arid condition. But even if it be possible, in the interest of a certain class of flock or herd owners to continue free grazing on public lands in the arid belt, it is clearly to the advantage of small owners to graze upon their own land under irrigation, when a civilized form of pastoral life may be enjoyed.

HOP GROWING.

Hop growers are confronted nearly everywhere by the same general conditions as fruit growers with regard to the need of fighting insect enemies. In England, the hop aphid is an annual visitant, whereas a few years ago their visits were periodical. Professor Whitehead, of Maidstone, states that spraying is now a recognized part of hop culture in England, and without due attention to treatment for aphid good crops of first-class hops would be impossible. The same is true in the United States, though many of our hop growers have the matter of fighting the pest so well in hand, and their appliances for administering remedial agents are so effective, that the old-time terrors of "hop louse" are not so keenly felt. One of the most extensive hop growers in the United States, Mr. E. Meeker, of Puyallup, Washington, in speaking of remedies for hop vermin, says:

"As to the remedy for damage by vermin, all are now agreed that the whale oil soap and quassia emulsion is the best. It is the most thorough and withal harmless as regards injury to the foliage or even the hops after they are formed."

Formula—Whale oil soap, 6 to 8 lbs.; quassia chips, 7 to 9 lbs.; water, 100 gallons. Soak the quassia chips in 30 gallons of cold water for five hours, then add the

soap, and after it is fully dissolved strain the liquid thoroughly.

Mr. Meeker estimates the cost of spraying per acre, where 225 gallons of the emulsion were used on each acre, at \$3.77, or for eight sprayings say \$30 per acre. His figures of cost, however, are based upon the prices prevailing in the Pacific Northwest, which are somewhat higher than obtain in the hop growing districts east of the Pacific states.

HAWAIIAN ISLANDS' RESOURCES.

The sugar crop of the Hawaiian Islands for 1890 is given by the press of Honolulu at 146,000 tons; 1892, 122,000; 1893, 152,000. It is believed that with increased irrigation facilities the annual crop may be brought up to 200,000 tons. It is also alleged that some 30,000,000 pounds of rice are annually produced in the islands, of which about two-thirds is consumed by the Chinese and Japanese residents. Good opportunities for engaging in coffee culture are alleged by those who publish the surprising resources of that region. It is claimed that the quality of Hawaiian coffee is equal to any that is grown in other parts of the world, and that its cultivation may be profitably engaged in on a large scale. Of course, all tropical fruits flourish in Hawaii, and it is also asserted that apples, peaches, plums, grapes and berries do well in selected locations. The Chinese gardener monopolizes as yet the cultivation of vegetables there as on our own Pacific coast. Potatoes, cabbage, peas, beans, melons, squashes and tomatoes are said to thrive remarkably in most of the islands and to bring good prices in the home markets.

JAPANESE FARMING.

It may interest readers of THE IRRIGATION AGE to learn something about farming in Japan. Our Department of Agriculture has lately collected statistics relating to the cereal crops of Japan for 1893, from which we find that the area of wheat harvested was 1,042,948 acres, and the total yield 16,477,373 bushels, or at the rate of 15.80 bushels per acre. This is a considerable larger yield per acre than we are accustomed to harvest in the United States as a whole, although in some individual states the yield has often exceeded that given for Japan. The acreage in barley last year in that country was 1,601,393 acres, and the product 36,841,391 bushels—23.01 bushels per acre. What is termed "naked barley" was also produced to the amount of 31,834,853 bushels, grown on 1,629,704 acres of ground, and yielding 19.53 bushels per acre. The manufacture of toys and other articles of straw, which industries have been carried on in Japan for centuries, enables barley farmers to

use their straw with good advantage. Large amounts of straw plaited goods have been shipped to many countries, and the export of this class of manufactures to the United States is rapidly increasing. This affords a brisk and increasing market for barley straw.

NITRATE OF SODA.

Nitrate of soda (Chile saltpeter) is regarded as one of the very best and cheapest of all fertilizers applied for their nitrogenous contents. In fact, it is about the cheapest source from which nitrogen in large supply may be easily obtained. Especially is nitrate of soda valuable for cabbages, cauliflowers, celery, spinach and beets. It has many advantages over most other nitrogenous fertilizers in that it is clean, easily applied, comparatively cheap and takes effect almost immediately. Of course, those farmers who have enough good stable manure need not necessarily use other forms of nitrate, but unless the supply is abundant and has been well prepared, it may be often necessary to supplement it by using commercial nitrates in addition. Nitrate of soda may be applied to crops either by sowing broadcast or by special application of small amounts about the roots of the plant. A tablespoonful scattered about the roots of cabbages and other plants will soon give good account of itself, and the application may be profitably repeated once or more during the season. When sown broadcast, 150 to 300 pounds to the acre may be applied with advantage. The main sources of this valuable substance are the nitrate beds in Chile, South America, although recent discoveries of it have been reported in the United States.

WHEAT OUTLOOK IN INDIA.

Word comes from India that, due to excessive rainfall during the present season, the wheat crop is suffering from an attack of rust, thus materially lessening the yield. While American farmers cannot but deplore a calamity to their fellow men in any part of the world, yet it is not improbable that rust in India, damage to the harvested grain by excessive rain lately reported in Argentina, and the diminished acreage sown to spring wheat in Russia, all taken together, may redound to the advantage of wheat growers in this country by stimulating to some extent the price for wheat in the foreign markets.

But American farmers cannot and should not rely upon calamities to befall wheat culture elsewhere to make living prices for their product. Wheat planting is rapidly extending in other countries, and the output is destined to increase from year to year with almost absolute certainty, especially in those countries where the cost of production has been brought to a

point below possible competition by the farmers of the United States. More diversified agriculture and lesser acreage in wheat should be the industrial policy of American farmers; at least, until conditions change to a more hopeful outlook in this direction, which event does not at this time appear imminent.

ARGENTINE WHEAT CROP.

The wheat crop of Argentina is rapidly increasing year by year. In 1893 the exports are reported at one million tons, or, say 33,000,000 bushels. The present season's crop is expected to be much larger than the last, due to a wider area sown and to an increased yield per acre. Should good weather prevail during the harvesting and threshing period, which is not yet assured, no doubt the surplus for export would be considerably increased. An almost unlimited area of virgin wheat land remains untouched in that country, and with the cheap labor obtainable there and the low cost of transportation to all great markets, Argentina will soon be found one of our strongest competitors in the wheat markets of the world. As a matter of fact, wheat can be produced on the plains of South America at a much less cost than is possible to our farmers in the United States. To meet such formidable competition our farmers must change entirely their methods of wheat culture if indeed it is possible to successfully meet it at all.

KEEP A "GARDEN PATCH."

Every farmstead should have a good "garden patch" as a source of family supply. It need not be large, but should be well cultivated and properly watered. A little plat 40 feet square, well irrigated, will often produce more and better supplies for the family table than an acre promiscuously planted, unwatered and poorly tended. Perhaps the cheapest piece of farm machinery, and most useful in proportion to its cost, is a good wind mill. Every farmer or gardener should make use of the power of the wind in pumping water, grinding grain and in various other ways known to every tiller of the soil. If no other use be made of the wind mill than to pump water for stock and for the family garden, its price may often be saved in a single year. A good garden, even if small, is not only valuable in saving cash outlays for needed vegetables and fruits, but it is a good physician as well as a civilizer. Its effect upon children alone is worth more than its cost. The ideas of order, neatness and thrift, which a well-kept vegetable, fruit or flower garden inculcates are valuable in shaping character and destiny, to say nothing of its economic value as a source of table supplies for the family.

WHEAT AREA IN RUSSIA REDUCED.

Reports from Russia are to the effect that the spring wheat area has been cut down this year from 30 to 40 per cent. owing to the low prices and to the lack of capital among the small farmers. It is believed that the result will be to cut down the large production of Russian wheat this year by many millions of bushels, which may have some slight influence on prices.

DETASSELLING CORN.

Experiments made at the Cornell, N. Y., Experiment Station show the beneficial effects of detasselling corn. During four seasons the experiments were conducted, and the results are announced as follows: In 1890, the detasselling resulted in a gain over corn not so treated of 50.6 per cent.; in 1891, the gain was very slight; in 1892, the gain was 21 per cent. and in 1893, the net gain was 19.3 per cent.

THE COTTON CROP.

The most valuable cotton crop ever produced in the United States was that of 1890. The plantation value of that year's crop given by the Department of Agriculture was, in round numbers, three hundred and fifty million dollars. Until 1890, the crop had never reached four billion pounds of cotton in any one season, but the output that year was 4,316,043,982 pounds, while that of 1891 was 4,506,575,984 pounds, and that of 1892 was 3,852,658,458 pounds, worth at the plantations \$268,000,000. The area in cotton is estimated at about 24,000,000 acres. The increase of the cotton crop since 1870 may be seen by the fact that the yield for that year was 2,020,693,736 pounds, but its value at the plantation was \$286,000,000, or \$18,000,000 more than the crop of 1892.

HOW TO IRRIGATE TREES.

The old Mexican method was to set the trees in a ditch and run in water until the land was waterlogged, then when the sun baked it hard it opened in wide cracks through which the moisture evaporated from the roots, leaving them dry and sun-scorched. The New Mexico Experimental College at Las Cruces has been pursuing the plan usually followed in California. This method is to open furrows and cross furrows between the rows of trees thus surrounding the trees on all sides by water furrows, into which a small head of water is run slowly, so as to give it time to sink to the roots, leaving the ground directly around the tree dry and easy to keep free of weeds. When the soil is dry enough, a cultivator is run between and across the rows.

GREELEY POTATOES.

Unless all signs fail Greeley farmers will this year eclipse all former records of potato shipments. They are just closing the biggest shipments ever made in the history of the district, and are preparing to put in a greater acreage than ever. From the Greeley district, which includes Greeley, Evans, Windsor, Eaton, Lucerne, Orr and Hotchkiss, 5,000 cars have been sent.

This report is noteworthy as not only does it represent the large volume of business done, but the quality of the potatoes grown. For the first time since Colorado potatoes have been shipped outside the state, they have gone this year to Ohio. This is like carrying coal to Newcastle, as Ohio potatoes used to be as standard as No. 1 wheat.

Greeley potatoes reach the market early in August, and begin shipping out late in the same month.

Greeley growers say that it was hard times that made the reputation of their potatoes abroad. Two years ago they raised a large crop, so large that they were unable to find buyers at home, and so made attempt to dispose of them elsewhere. This year has seen them sold in Ohio, a surprise to Denver commission men as it is to Greeley farmers.

POTATO SCAB.

A weak solution of corrosive sublimate (two and one-fourth ounces dissolved in fifteen gallons of water) will prevent potato scab if the seed potatoes are immersed in it before planting. Do not plant them in ground which has produced a scabby crop. Corrosive sublimate, being a poison, should be handled carefully, and care taken to plant all the potatoes treated. Use a wooden vessel, as metal is quickly corroded.

The Italian agriculturists demand a protective duty. They especially desire a heavier duty on imported wheat. After Russia, the United States and Canada are the countries that import the greatest amount of wheat into Italy.

Sugar cane is mentioned by Strabo as known in India as early as 325 B. C. It was then used in its raw state, no method being known for extraction of the sugar.

The sweet potato is one of the most valuable crops grown either for market or home consumption. They are a cheap milk producer, and cattle are very fond of them.

The farmers of the Arkansas valley who have grown sweet potatoes have no reason to complain. An average yield under irrigation is 250 bushels to the acre.

HORTICULTURE BY IRRIGATION.

RELATIVE VALUES OF FRESH AND DRIED FRUITS.

FOR the present, at least, the whole country must turn to California for some of the most important and conclusive experience relating to various features of the fruit industry. In many of its forms, the fruit business is carried on so extensively in that State, and by so business-like methods, that results have been formulated more exactly than in most other sections; hence a practical value attaches to

in the Santa Clara valley is known as the West Side Fruit Growers' Association. During the past three or four years this organization has been a highly successful operation, and its methods have met the approval of the best business men in the community. From the books of this association the following table was compiled, showing the relative values of fresh and dried fruits of various kinds. While some of the fruits named are not grown in most parts of the United States, yet they are all grown extensively in some parts outside of California; hence the table

RELATIVE VALUES OF FRESH AND DRIED FRUITS.

FRUIT.	Pounds fresh, to make one of dry.		Cost of drying per drying pound.	Equivalent net prices per 100 lbs. of dried, compared with prices per green ton, on basis of shrinkage of 1891.								Net average price per 100 lbs. realized for dried fruits after paying all expenses.	
				FRESH FRUIT PER TON.									
	1891	1892		\$20.00	\$25.00	\$30.00	\$35.00	\$40.00	\$45.00	\$50.00			
				DRIED FRUIT PER 100 LBS.								1891	1892
Moor Park Apricots...	\$0.05¼	\$0.05½	2 cts.	\$7.25	\$8.56	\$ 9.87½	\$11.18	\$12.50	\$13.81	\$15.12	\$7.25	\$15.00	
Other Apricots.....	.06¼	.05¾	2 cts.	8.25	9.81	11.37	12.94	14.50	16.06	17.62	6.50	13.13	
Early Peaches.....	.05½	.05¾	1½ cts.	7.00	8.37½	9.75	11.12	12.50	13.87	15.25	5.50	11.00	
Late Peaches.....	.05	.04½	1½ cts.	6.50	7.75	9.00	10.25	11.50	12.75	14.00	None } Dried }	None } Dried }	
French Prunes.....	2.54	1.92	¾ ct.	3.25	3.87½	4.56	5.19	5.83	6.46	7.10	5.36	8.87½	

the figures showing the results of operations on a large scale by well-conducted establishments in that State. Santa Clara county, of which the principal city is San Jose, is to the deciduous fruit industry of California what Los Angeles or Riverside county is to the citrus fruit industry. The curing of various fruits is probably done more scientifically on a large scale in Santa Clara county than in any other county in the United States. Its annual output of prunes surpasses by far all other parts of the United States together, and its product of peaches, apricots, berries and other fruits is enormous. One of the best evidences of the advanced condition of the fruit industry in that county is the number and strength of the various organizations of fruit producers. Co-operation is the watchword of that part of California, and the good results which have been achieved there have stimulated organization of growers in every part of the State. One of the most progressive and successful of the local associations of fruit growers

will prove of great value to all growers in the mountain and Pacific States, and of much interest to all fruit growers everywhere.

In California, as elsewhere, the shrinkage in weight due to drying fruits varies with the seasons. In a wet year, or when orchards are unduly irrigated, the shrinkage is naturally more than in drier seasons. In 1893, careful attention to all necessary details brought out the fact that the fruits of another drying association in the same county shrank in the following ratios:

Apricots, all varieties.....	5.56 to 1
Peaches "	6.04 " 1
Pears "	7.11 " 1
Nectarines "	8.00 " 1
French Prunes.....	2.66 " 1
Silver "	3.18 " 1
German "	2.86 " 1
Egg Plums.....	4.93 " 1

Readers of THE AGE should compare prices paid by them for California dried fruits in 1891-2 with those for which the fruits sold, as shown by the table first above presented. The prices given in the table are of course average prices for the whole amount of fruit dried by the association, and necessarily represented different grades. It may be here said, however, that the fruits prepared by these co-operative drying associations are put up in the most cleanly manner, and that throughout all the operations the greatest care and cleanliness are observed, thus adding not only to their value as staple articles of food, but very properly to their market value also.

TURKISH VINEYARDS.

La Nature, a French publication, states that about Constantinople, Turkey, the vineyards have been attacked by phylloxera, but that the disease makes only slow progress from the fact that the vines are those planted at a depth of one meter—over three feet. It is alleged that the roots of the vines planted at that depth attain large dimensions under ground, and thus offer greater resistance to the disease.

This mode of planting is in striking contrast with that of planting orange trees in Florida on little mounds with no hole at all, except that made by pushing the hoe handle down into the loose, sandy soil to contain the tap root. It is alleged by many who thus plant orange trees that the nearer the surface they can keep the roots of the tree the better. They claim that the influence of the sun is better utilized in that way, resulting in sweeter and better fruit and healthier trees than in cases where they are planted deeper, and have to push out their first rootlets in a colder and less inviting environment. The two cases cited, however, would seem to indicate extremes in fruit planting, between which a happy mean may be generally found.

REMEDY AGAINST CUTWORMS.

In many sections of the country cutworms are one of the most persistent pests with which farmers and fruit growers have to contend. Every spring they present themselves with unfailing regularity and in great numbers. In almost every state corn, melons and other spring crops are annually subjected to the ravages of cutworms. It is often necessary for farmers to replant most of their spring crops, and in many instances two or more replantings are necessary. In California and some other sections of the country cutworms have worked on vineyards and fruit orchards with disastrous effect. Hundreds of acres of the finest raisin vineyards in that state have been completely stripped of their leaves and the first crop of

grapes entirely destroyed. In many orchards of deciduous fruits the trees have been attacked and completely defoliated, practically destroying the crop. Many remedies have been tried, some of them effective and many of them not so. Among the successful remedies used for the cutworm pest, probably the most efficient and least expensive is the following: Mix three pounds of Paris green with a grain sackful of dry wheat bran, stirring well in order to thoroughly distribute the poison throughout the mass of bran; moisten sufficiently to make the mixture adhere, then with pails or other vessels carry it along the rows of vines or trees and deposit a handful or two on the ground close around the base of the tree or vine.

The worms work mostly at night, avoiding the hot sun, hence if the poisonous mixture be deposited just before nightfall, it will be likely to nearly complete the work of extermination the first night. Should the bran blow away after having become dry, it should be renewed until the worms are destroyed. It has been found in practice in Southern California that ten pounds of Paris green and a few sacks of bran will suffice for thirty acres of raisin vineyard, and for orchards the quantity would be less owing to the greater distance between trees. It is found that the worms eat this poisoned bran with avidity, and that they are thus destroyed before doing any damage to the leaves of tree or vine. For this reason it is far preferable to the method of spraying the leaves with Paris green or other poison, since, in the latter case, the leaves must be eaten by the worm in order that it may take the poison. The same treatment has been found effective with corn, melons, cabbage and tomato plants.

THIN YOUR FRUITS.

Fruit growers especially should remember that the great effort of nature in the production of a crop of fruit is largely expended in her struggle to mature the seeds. The concern of mother nature for her offspring relates mainly to their ability to propagate their kind, and not to the gustatory pleasures they may afford to the destroyer—man. But the strength and vitality are, for a given time, a fixed quantity, and if a great number of fruits are left upon the tree, that strength which the tree possesses and is able to maintain from the soil will be expended to the best of its ability in maturing the seeds of the fruit. This may be and often is accomplished at the expense of size and flavor in the edible parts of the fruit itself. Herein lies the philosophy of thinning fruits on the tree. By reducing the number of seeds to be matured, the life forces of the tree are thrown into a lesser number, with the almost certain result that the

fruit will be larger in size, better matured and far more valuable in market. It is an entirely safe assertion that 100 peaches, each weighing one pound, would sell in any market for four times as much money as 1,000 peaches, each weighing one-tenth of a pound. And while this is true, it is also true that the trees bearing the fruit would have parted with their strength and vitality in inverse ratio of the value of the fruit produced. Among the most careful and successful fruit growers in all parts of the country the thinning of fruit on the trees is as much a part of staple orchard work as the final harvesting of the crop. In some fruit-growing regions it is alleged that it is profitable to thin all fruits, though in most places there are exceptions to this rule, at least in practice. It requires careful labor to thin fruit judiciously, and such labor should and does command an advanced wage. But probably no labor applied to the orchard is really more profitable than that devoted to thinning the fruit. Sometimes, to be sure, frost or wind does a large part of the work of thinning, but as a rule it is badly done if left to such agencies, and they cannot be relied upon. The well-known Connecticut peach grower, Mr. J. H. Hale, alleges that he has produced good crops of peaches after 90 per cent. of the blossoms had been killed by frost. This fact merely emphasizes the paramount duty of all orchardists to thin their fruit. The proper time, as has been heretofore stated in *THE AGE*, is just as the pits begin to harden, and before the drain upon the vitality of the tree has become heavy. To all growers of deciduous fruits we therefore say: Thin your fruits with vigorous hand; it will put money in your purse.

PACKING FRUIT FOR LONG SHIPMENT.

Nothing better illustrates the value of painstaking care in the shipment of fruit to distant markets than the experience of Mr. Frank Alling, of Tacoma, Washington. Mr. Alling conceived the idea of shipping the fine fruits of the Sound region to the Orient, and made a number of shipments of both apples and pears to Japan with very satisfactory results. The distance shipped covered somewhat over 5,000 miles, and the time nearly twenty days; and yet so carefully was the fruit selected, prepared and handled, that it arrived in excellent order and sold at good prices. In view of the complete success of these shipments, it is of interest to note the manner in which the fruit was packed.

The boxes in which the apples were shipped held about 30 pounds each, the top and bottom being made each of a single board, and were as nearly airtight as possible. Each apple was carefully wrapped in four thicknesses of tissue paper, and gently placed in the box, which had been well lined with bright colored

paper. Between the layers of fruit six sheets of tissue paper were placed, the whole being made tight in the box before the cover was nailed down.

Pears were handled just as carefully, and the boxes contained only two layers of fruit, the number averaging forty-eight to the box. Each fruit was carefully wrapped, as in the case of apples, and the boxes are prepared in a similar manner. On arrival at Yokohama the fruit was placed in cold storage for subsequent distribution to the markets of Japan as well as China. Mr. Alling has also sent other fruits to these faraway markets, and in all cases he has met with success. What is of especial interest in this connection is that this fruit was always shipped in tight boxes, without the possibility of a free circulation of air, whereas it is stoutly alleged by many shippers that all fruit should have good ventilation, and should not be closely boxed for long shipment. These successful experiments of Mr. Alling are instructive at least, and show that a free circulation of air among such fruit is not necessary when shipped in the manner adopted by the Tacoma dealer. But the question of more or less ventilation of fruits en route to market is one of fact rather than theory. If repeated experiments show that fruit packed and shipped in a certain way reaches the market in good condition and sells at satisfactory prices, that is all that should be required, whether or not the experience accords with a preconceived theory.

INSECT ENEMIES.

It is announced that the praying mantis, well known to be a formidable enemy of caterpillars, is being propagated under the direction of the Oregon State Horticultural Society, for distribution among the orchardists of that State. As a general statement it may be said that no better service to horticulture can be rendered than the introduction of natural enemies of the insect pests that afflict the fruit grower at every turn. If friendly parasites can be naturalized in our orchards and vineyards, they will be found by far the best and cheapest remedies against the ravages of most insect pests. The eggs hatched in Oregon came from Japan, and a full line of experiments is to be tried in order to test most carefully the efficacy of this friendly parasite. The insect receives its name from its peculiar attitude while attacking its prey.

It is due to the intelligent horticultural societies in the various States of the Union, and to the invaluable labors of the Experiment Stations of the Department of Agriculture, that very many if not indeed most of the formidable enemies of the fruit growers are at last made controllable, if reasonable diligence be exercised. Whatever may be said by old-fashioned horticulturists against the value of book farm-

ing, it is unquestionable that no man may, in these days, successfully manage a farm or orchard without the aid of books or periodicals treating of the business.

KEROSENE FOR PEAR LEAF BLISTER.

Kerosene oil diluted with not more than eight parts of water is found to be effective with pear leaf blister caused by the *Phytoptus pyri*, a microscopic insect believed to have been imported from Europe on nursery stock. Professor Alexander Craw, entomologist of the California State Board of Horticulture, also recommends dusting the trees with powdered sulphur, the same as for red spider. From the high authorities quoted, it would appear to be merely a matter of expense or convenience as to the method each grower should adopt. In any event, however, careful watch should be kept upon the pear trees, and whenever blisters appear upon the leaves the remedy should be applied without delay.

DO BEES INJURE ORCHARDS?

In many sections of the country there exists a certain degree of hostility between orchardists and beekeepers. Fruit growers allege that bees, when kept in great number near their orchards, work much damage to fruit by puncturing the skin and extracting the juices. Especially is this alleged with reference to certain varieties of grapes, though nearly all deciduous fruits are said to be affected injuriously in the same manner. On the other hand, the most reliable and skillful apiarists stoutly assert that the bees are unjustly accused, and that the damage they are said to bring to fruit crops is really due to other agencies. Birds, wasps and sometimes other animals or insects first break the skins of fruit and thus allow the juices to exude; the bees in search of honey then visit such fruit, and the casual observer takes it for granted that they wrought the mischief in the first place. Professor Cook, late of the University of Michigan, now of Southern California, has given much attention to this subject, and his conclusion is that the bees only visit the fruit after its juices are brought out from other causes, hence do primarily no damage whatever to fruit. Moreover, Professor Cook maintains that bees are the best friends of the fruit-growers, and that most varieties of fruit bear much more surely and abundantly if bees have access to the trees during the period of their blooming.

PHOSPHATE AS A FERTILIZER.

To mature the seeds of nearly all fruits or plants requires a due proportion of phosphate in the soil. This must exist naturally or must be applied artificially. Continued cropping will, of course, eventu-

ally exhaust any natural supply of phosphate in the soil, hence artificial application must finally be resorted to in any case. Whenever, in the evolution of fruits, for example, we shall have eliminated the seeds, as in the banana, the navel orange and many other fruits, the needed supply of phosphates for the maturity of a fruit crop will be greatly lessened. But in order to properly develop and mature a crop of fruit containing seeds, as nearly all fruits do, it is necessary that due attention be paid to supplying a fair proportion of phosphate in the fertilizers used. Pure ground bone, as finely pulverized as possible, is probably as good a form as any in which to apply the needed phosphates to crops of any kind. In this form, however, the action of the fertilizer is not observed so soon, perhaps, as when applied in some other form, but the good effects are certain to appear without long delay. Still, for most crops there are special fertilizers prepared, and when they may be bought with reasonable surety of having been honestly prepared and sold, there is little risk in securing them, at least as a supplement to the staple manures of the farmyard, which should always be carefully preserved and applied.

FEED THE FRUIT TREES.

As horticulturists the Germans have few equals, and possibly no superiors. Von Mocke once said: "Feed your fruit trees as well and regularly as you feed your pigs and calves." The German chemist for the German Horticultural Society in Munich makes the following suggestions:

The fruit tree requires the same food stuffs necessary to all other plants. Of this large number, however, three—nitrogen, potash and phosphoric acid—are to be specially considered, and under certain circumstances, also lime. The complete absence of any one of these food materials prevents the growth of the tree.

For a prevention of soil exhaustion a change in the sorts of fruit trees is often to be recommended. For example, flat rooted stone fruits may still find food where deep going stone fruits no longer thrive; but through such means the condition of the soil is not improved, and complete soil exhaustion or weakening of the trees is sure to come.

Such a soil exhaustion in which the feed materials become deficient cannot be compensated by supplies of the best soil; but it must be supplied in rich food stuffs in easily accessible forms. Now the potash and phosphoric acid of the top soil will be unavailable, so that as much as possible a deep application of both these food stuffs should be looked to so that the roots in the deeper strata shall not suffer from any deficiency.

Defective nourishment influences the wood growth and also especially the fruit crop. An excess of nitrogen with a rich supply of potash increases the tendency of wood growth but decreases fruitfulness. The latter influence is least with young trees. Potash and phosphoric acid alone can make a large fruit crop, the wood growth on the contrary remaining weak; but the fruit cannot reach full development in case of continued nitrogen hunger. Under all these conditions, however, much depends on the condition of the soil and the water supply.

HILLSIDE ORCHARDS.

Other things being equal orchards should be planted upon gently sloping hillsides, and always upon land that is well drained. Few if any varieties of fruit trees will thrive with "wet feet," and standing water in an orchard should never be allowed. It has been often found that a north slope is best for peaches and some other of the less hardy fruits, by preventing the too early blooming of the trees and consequent injury by late spring frosts.

Another advantage of having the orchard on the higher lands is that it is much less liable to damage by frost than when located in the lower valley lands. "Frost drainage" is well understood by many orchardists. That is, frost, like water, follows the lower channels and also like water, cold air may be drained away from the higher to the lower levels leaving the high land orchards intact while often destroying those on low, level land. Except as limited by the convenience of cultivation or irrigation, an orchard may be successfully grown upon steep hillsides whose fertility has not been washed away, leaving the rock too near the surface.

California has the largest prune orchards in the world. A new one, taking three thousand acres, will be started next spring. There is room for a greatly increased supply of prunes, as they are not an article of common consumption in the average family, and the possibilities of this fruit in the cookery line have not been half learned yet. Prunes are healthful and cheap, these being two attributes desirable for articles to be common in the family. The prune orchards have a chance to increase the supply, and the demand will come up to it, even if that is a reversal of the old way of putting the saying.

The Alessandro Orange Grove Company are planning to plant about 200 acres of their Moreno property to oranges.

NEW MEXICO EXPERIMENT STATION.

The following note on insect pests is taken from the New Mexico *Entomologist*:

A new pest of apple was discovered at Mesilla lately. It is a small beetle boring in the bark; likely to be decidedly troublesome should it become numerous. It is hoped to make it the subject of a special investigation hereafter.

Some peach orchards in Kern county are said to be damaged considerably by late frosts while most of the apricots have fallen off the trees. Pears are not hurt.

RASPBERRY RUST.

Raspberry rust is a great drawback to the production of that toothsome berry, and growers should look well to the spraying of the canes with the Bordeaux mixture at the first appearance of rust. It is alleged that in some parts of the country certain varieties have proven to be rust proof; among these may be mentioned the "Kansas" berry.

BLACK ROT IN GRAPE.

This disease is caused by the growth of a very small plant, which can only be seen with a microscope, belonging to the group of plants classed as fungi. Its growth starts from a spore, corresponding to seed in higher plants, germinating early in the spring and usually makes its first appearance on the leaves, in small brownish spots afterward upon the fruit.

It can be prevented by spraying early with the Bordeaux mixture.

A full discussion of the life history of black rot in the grape, methods of preparing and applying the Bordeaux mixture are given in illustrated bulletin No. 23 of the Texas Experiment Station.

Judge Virden, of Mono county, California, has decided that sheep may not be watered in a creek which had been used for irrigating purposes by a rancher near Bridgeport. His decision was sustained by the Supreme Court. The injunction against the sheep men was made perpetual.—*Rural Press*.

Dr. N. G. Blalock lately received an order for ten thousand fruit trees to be transplanted on lands reclaimed from the desert in the Yakima valley by irrigation.

Two-thirds of the fruit of the world is grown on irrigated land.

COLONY BUILDING IN ARID AMERICA.

THE MARCH OF THE COLONIST.

THE past winter has witnessed a notable growth in the movement of people to the irrigated lands. California is, of course, the principal field for winter operations, and we believe there were more homeseekers in California this past winter than ever before, except in boom times. Furthermore, it may be confidently predicted that next year's emigration to California will exceed this year's very largely. The number of practicable enterprises in the field has largely increased. The machinery they have erected in the East will begin to grind out its grist in earnest at the beginning of the next season.

But other States than California are getting well under way with colonization plans. Extraordinary efforts are being put forth in behalf of the San Luis valley of Colorado. Plans for large operations are on foot in Utah. Several unique and interesting colonies are being worked up in connection with irrigated lands in Idaho. Washington is also pushing rapidly to the front in this direction.

A newspaper item reports the departure of a party consisting of more than 100 families from Kansas, bound for the Canadian Northwest. It is added that several other large parties will soon follow. Many of these people are well-to-do. They are leaving Kansas because they have become disgusted with the condition prevailing there. "The reader of such news must be impressed with the thought that it is a shame for those people to be permitted to go off into the far Northwest when there is a better field here for them to occupy," says the Boise (Idaho) *Statesman*. "They go there because that country has been advertised—because agents have been sent among them to portray its advantages to them. They do not come here because they have not been made acquainted with Idaho's superior attractions."

Large clubs are being organized in Minnesota for the purpose of taking of lands in Florida. The South is showing much activity in this matter. A strong company has been incorporated at Baltimore to promote colonization in the South.

A despatch from Douglas, Wyoming, says: "J. M. Brockway, Alexander Brockway, James A. Brockway, David S. Brockway, Willard Virden, G. W. Dickson, Mrs. Matilda Foggett and Miss Maggie E. Brock, way of Douglas have just located 2,000 acres of the choicest land on the Fort Fetterman reservation near

Douglas. It is the intention to at once begin the construction of an irrigating canal from the Platte river to irrigate the lands. The survey for the ditch has already been completed. It will require a large sum of money to complete the ditch, and it is only through the combined efforts of the colony that it will be possible to carry the enterprise to a successful completion. The selection comprises some of the finest agricultural land in the State and the development of the tract will mean a great deal to the city of Douglas."

A wave of emigration from eastern and central states seems to be flowing in the direction of South Dakota. They are settling up the artesian well belt and the tract opened by the Government in 1889. The artesian well belt comprises the James river valley and extends from Aberdeen south to Springfield. It has a large number of wells which supply on the average about seven thousand gallons of water per minute. These wells not only furnish water for irrigation but motive power for the cities and towns. The settlers are not all farmers, some of them establishing tanneries, fiber mills, dairies and fruiteries and other industries.

Nevada is not behind her sister states in seeking settlers. The State Board of Immigration has issued a pamphlet for gratuitous distribution giving the resources of the State and illustrated with photogrames.

The announcement is made by the Land of Sunshine Company that Cosmopolis is only one of many colonies now being organized to settle on their lands in the vicinity of Merced, California.

Wyoming reports that an Omaha colonization company expects to locate on the Big Horn river during the summer, and will dig a canal to irrigate the land.

Spokane, Washington, is making an attempt to secure settlers, and has organized a Bureau of Immigration to take charge of the work.

Colorado expects to have a number of families of farmers and home-seekers settle on the irrigated lands within her borders this year.

ELECTRICITY AND WATER POWER.

A POWER plant on the upper waters of the San Gabriel river, California, is shortly to be constructed for the purpose of furnishing electricity for power and other purposes for use in the Azusa valley. There will be 30,000 feet of six-foot cement tunnel through a mountain cliff, from which the water will fall 400 feet into the canyon below. The work is estimated to cost \$250,000, besides the power and the electrical machinery. It is expected that the machinery will be in operation within a year.

The above shows what is being done, and such examples as Great Falls, Montana, and Wiliamette Falls, Portland, Oregon, where the current is transmitted fifteen miles from the falls to the city, shows what has and can be done.

Electricity is the coming power, and in its relation to irrigation it has unbounded possibilities. The vast water power throughout the arid region in the majority of cases is absolutely going to waste, when at a comparatively small expense it could be utilized to run machinery for all purposes and pumps, which will pour the water on the thirsty land. And who can calculate the benefits when the touch of living water shall have made the desert blossom as the rose? Harness the water-fall and make it obey man's bidding in this, the great subject of the coming future—irrigation.

Practical tests of an electric plow are being made by Siemens and Halske on a German estate. It is believed that such a plow would prove especially successful in Java, where the cattle plague has destroyed the draught animals, and large tracts of fertile land are being permitted to lie uncultivated in consequence. And if successful in Java, why not in Arid America, provided the cost of operating can be reduced to an economical basis.

Prof. Alexander Graham Bell is working on a contrivance which he claims will enable us to see by electricity. The vibrations of light being so much more rapid than those of sound, the difficulty heretofore has been to discover a diaphragm sufficiently sensitive to receive the vibrations and produce the effect necessary to convey the proper impressions to the human vision. Prof. Bell is confident that this can be done and is hopeful that he will soon be able to do it.

And what a prospect! With the long distance telephone one can now transmit messages from New York to Chicago, and the future promises still more wonderful things in that direction. With the proposed new instrument in connection one could see the party with whom he converses, and if it can be accomplished for that distance, why not for greater distances.

Prof. Bell insists that the fact has been already demonstrated and that it only remains to construct the necessary apparatus to bring the discovery into actual and practical use.

An arrangement for heating water by an incandescent electric lamp in the lighting circuit has been devised by M. Leon Pitot, of Paris, by which he utilizes 85 per cent. of the heat given out by the lamp. He claims that an eight-candle lamp will maintain the water at a temperature of 40 degrees centigrade, while a 16-candle lamp will maintain it at boiling point. The receptacle, holding about a pint, affords, with the larger lamp, boiling water in 10 minutes.—*Iron and Industries.*

The San Antonio Electric Light and Power Company of Pomona have a force of men at work in Mill Creek canyon, about ten miles above the Redlands Electric Light Company power-house, developing water for electric purposes. When work is completed they will erect the necessary machinery and compete with our home company in furnishing Redlands electricity, as well as outside towns.—*Redlands Leader.*

This is a progressive age. The king of Korea has purchased an electric light plant in this country, which will have 3,000 incandescent lamps, and will illuminate the king's palace and grounds. The people of this far-off country can no longer be spoken of as "sitting in darkness."

A movement is on foot to build an electric line from Colorado Springs to Cripple Creek, Col., and to also connect Victor and Altman. A party of eastern capitalists is said to be behind the scheme.

The council of Andrus, South Dakota, has the question of a municipal electric light plant under consideration.

The new electric light plant at Hooper, Neb., will be in operation in a few days.

PULSE OF THE IRRIGATION INDUSTRY.

CENTER OF POPULATION.

A REMARKABLE feature of the spread of population to all parts of the United States is that the center of population has moved almost directly westward for the past 100 years. The following table, taken from the compendium of the eleventh census, recently issued by the Census Bureau, will present more completely this interesting phase of American development:

POSITION OF CENTER OF POPULATION, 1790-1890.

Census Years.	North Latitude.	West Longitude.	Approximate Location Near Important Towns.	Westward Movement in Miles During Preceding Decade.
1790	39° 16.5'	76° 11.2'	23 miles east of Baltimore, Md.	
1800	39° 16.1'	76° 56.5'	13 miles west of Baltimore, Md.	
1810	39° 11.5'	77° 37.2'	40 miles northwest by west of Washington, D. C.	41
1820	39° 5.7'	78° 33.0'	16 miles north of Woodstock, Va.	36
1830	38° 57.9'	79° 16.9'	19 miles southwest Moorefield, W. Va.	50
1840	39° 2.0'	80° 18.0'	16 miles south of Clarksburg, W. Va.	39
1850	38° 59.0'	81° 19.0'	23 miles southeast Parkersburg, W. Va.	55
1860	39° 4'	82° 43.8'	20 miles south Chillicothe, Ohio	55
1870	39° 12.0'	83° 35.7'	43 miles east by north of Cincinnati, Ohio	81
1880	39° 4.1'	84° 39.7'	8 miles west by south Cincinnati, Ohio	42
1890	39° 11.9'	85° 32.9'	20 miles east of Columbus, Ind.	53
				43

MORE WIND MILLS.

Farmers in the vicinity of Garden City, Kansas, have very generally equipped their places with irrigating pumps and nearly every farmer around the city has now one of these pumps. Some calculate to irrigate only five or six acres but most of them with a capacity sufficient for twenty acres. It sounds rather strange, to say that one eight inch pump run by a fourteen foot wind mill will successfully irrigate twenty acres in the driest season, but such is the fact demonstrated by from one to four years' experience. An eight inch pump will pump six thousand gallons an hour with an ordinary wind, and one can readily figure the amount of surface it will irrigate. It easily fills a

pond four feet deep and one hundred and fifty square in two days. This will run thirty-six inches of its water out on the level and will irrigate to a depth of two inches rather more than four acres at a time allowing for a percentage of loss by seepage and other waste. By starting early in the spring before the moisture is used for growing crops, and getting the ground thoroughly soaked they are able to keep twenty acres well watered the season through. This is not an experiment and is not theoretical. It is practical and is done by a score of farmers around Garden City.

Twenty acres well irrigated and divided up properly will do what? Ten acres in alfalfa well watered will net \$500 in cash every year and give at least sixty tons of good feed besides. This has been demonstrated over and over again. The other ten acres in orchard, small fruit and vegetables, together with half a dozen cows and some hens will nearly keep an average family. In other words, that twenty acres will run the average family without another dollar from any other source, and you are, with this outfit, independent of the season.

Let us look at it from another point of view. Suppose every farmer had such a pump with a pond 150 feet square and twenty acres thoroughly irrigated each year. What would be the effect both on hot winds and the rainfall? Would it not rob the hot wind of its danger and increase the rainfall? No practical man can doubt that it would.

NORTHERN NEW MEXICO.

"Some people might think, what good can come out of Northern New Mexico?" writes a subscriber. "Well, I will tell you; we have the San Juan river, a stream of water sufficient to irrigate 100,000 acres of land, and we have the land to go with it. We have also the climate to go with the land and water. Now, what do we lack? We lack capital and enterprise. Make a visit to Durango, Colo., in the early fall and inquire as to where their fruit comes from and apples, peaches, pears, grapes, plums, strawberries, etc. Ask to see and taste their honey, all of which comes from San Juan county, N. M. Take a trip down the Animas river to Farmington, then up the Laplatta and see the ricks of alfalfa and the vegetables. Then you can have some idea as to what can be done on the San Juan river."

The reclamation of our semi-arid lands by irrigation is a live subject that is stirring not only the dwellers upon the great plains, but men who are looking about now for homes. Kansas, Nebraska and Colorado have a vast area of semi-arid lands, and just how to irrigate these lands in the most economic method is something very essential to know. The first step is a step to be taken by the government, not that the government is asked to construct the actual realities of irrigation, but that it should go to the cost of ascertaining the economic facts necessary to induce capital to enter upon the work on an intelligent basis. This is being done to a limited extent, but it is not being pushed in the manner in which it should be. Let it once be shown that a reasonable reward awaits the investment of capital in the reclamation of arid lands and capital will be eager to forward such enterprises.

Late reports indicate that work is being pushed on the Arrowhead system of irrigation in Southern California. Some 8,000 feet of tunnel will soon be completed, and the necessary steps for impounding a vast quantity of water among the San Bernardino mountains are being taken.

The management of the Pecos Irrigation and Improvement Company, of New Mexico, is going to undertake to dispose of the alfalfa crop this year in eastern and European markets, to get the largest possible profit for producers. This course should be appreciated by the people.

There seems to be a disposition on the part of large land owners to subdivide their immense holdings and sell them to actual settlers at a reasonable price. The coming time of small farms irrigated and intensively cultivated means the opening of a new era of prosperity.

Wyoming has 30,000 square miles of coal deposits. There are 6,000 miles of irrigating canals, watering 2,000,000 acres. The canal cost over \$10,000,000. The live stock interests exceed \$100,000,000 in value.

King county, Arizona, claims to have more wind-mills than any town of its size in the State and the supply of water seems practically unlimited.

The Colorado desert will soon, with the application of water from the big river, become one of the loveliest gardens of the world.

The canaigre tannin plant will soon be one of Arizona's most valued growths.

The Crow Creek Land Company, Colorado, owns 3,500 acres of good arable soil. Owning the Ogilvy ditch they are well provided with water, an average of 2,000 inches running in it daily.* This is a seepage ditch and is well supplied with water when neighboring ditches are running scant. The land owned by this company is along the Platte river, the ranch house of Manager Ewing being situated about 10 miles east of Greeley. The company is dividing the land into small farms of 40 acres and upward and renting it to practical farmers.

Last year the cultivated land produced per acre from 30 to 35 bushels of wheat, 40 to 45 bushels of oats and 125 sacks of potatoes.

Congress lately assigned the space of twenty minutes for discussion of the important topic of irrigation and after wasting an hour or two in filibustering against a motion to extend the time to sixty minutes compromised on thirty. The need of irrigation as a method by which seventeen States and Territories could be practically added to the public domain and by which the agricultural and horticultural products could be multiplied and improved immeasurably, not to mention the sociological feature, was to be discussed in half an hour. It is to be hoped the congressmen will soon see the error of their ways.

To find the horse-power required to elevate water to a given height, multiply the number of gallons raised per minute by $8\frac{1}{2}$, and this by the height in feet, and divide the product by 33,000, which gives theoretical horse-power. In ordinary practice 50 to 100 per cent. should be added to provide for friction of pumps and water in pipes.

Secretary Morton takes a conservative view of the irrigation question. The \$10,000 appropriated by Congress are being used to gather available information that will enable the people to secure irrigation at the least expense.

Texas farmers and stockmen are rejoicing over the break in the terrible drouth. They are going ahead with various irrigation enterprises, however, and some time will not dread the drouth as they do now.

A newspaper item says the drouth in Southern California will result in a boom for irrigation.

A local irrigation association has been formed at Indianola, Red Willow county, Neb.

A gallon of fresh water weighs 8.34 pounds, and contains 231 cubic inches.

CANALS.

Arizona.—THE WILLIAMS DAM.—Twenty additional men have been added to the large force employed on the addition to the dam since the arrival of Lantry & Son's foreman, and work on the structure has commenced in earnest. Forty men are now employed on the work, and aside from the excavation being made a large force of men are busily engaged erecting the necessary derricks and putting the hoisting machinery in place. Foreman Kennedy says that in all probability everything will be in readiness for the masons within a short time, when an additional force will be employed. With the completion of this work the capacity of the reservoir will be more than doubled, something like 41,000-000 gallons, as estimated by Chief Engineer Burns. This will make the dam the largest in the southwest, and there need be no fear that it will ever give way, for in its construction nothing but the very best material will be used, concrete being the principal. The water in the Santa Cruz is lower than ever before, a fact which materially aids the work of development of water for the Canoa canal from the underground flow of that stream. More water is being developed daily, and there is an abundance for all crops. The reorganization of the canal company is viewed with a great deal of satisfaction the entire length of the Casa Grande Valley, and it is anticipated that the new corporation will meet all the requirements of its franchise. With the water service reliable this valley will soon become a veritable paradise. Sunday there was a break in the canal, two or three miles above Arizola, through which a large quantity of water went to waste. At this season, when the pressure on the banks of the canal is normal only, such occurrences should not transpire, and could be prevented by a little watchfulness. Trouble is likely to result to the Florence Canal Company and to the consumers because of shortage of water on the Pima and Maricopa reservation. The yield of wheat in past years from these Indians has been from six to eight millions pounds annually. Last year, because of insufficient water, it was one million and three-quarters pounds, and this year it will be less. Their crops are suffering now, and in a short time will be without water. The lateral from the Florence canal, which was to convey water to the Gila river at a point just above the Montezuma ranch, where the first reservation ditch is taken out, has never been completed, and the water guaranteed to these Indians by the company has never been furnished.

New Mexico.—The seepage at the new Eddy dam has nearly ceased, though more earth is being thrown on the upper slope. The first rise that brings sediment will leave a cemented surface on the dam that will make it waterproof.

California.—Representative Maguire has endorsed the idea of putting the various industrial armies to work at building irrigation canals. He believes that the government should establish a national system of irrigation for arid lands, and give the laborers employed in building the canals an opportunity to find homes on the land reclaimed. The tracks served by the ditches would be allotted to the users on unlimited leases, but not sold. Undoubtedly there are many men in these aggregations who honestly want to work. Undoubtedly there are many others who would be scattered by the offer of a job as effectively as by a gatling gun. It would be unnecessary to begin the construction of irrigation works on an enormous and unmanageable scale. One system of moderate extent in a single drainage area would provide for all the men who would be likely to take advantage of the offer of work, without straining the resources of the government. The men could be paid wages a little below the market rates, and part of this could be given them in scrip, receivable for rent of irrigated lands. If the undertaking were in charge of army engineers and carried out with military discipline, there would be no danger of much annoyance from tramps. The construction of national irrigation works would be a benefit well worth attaining at any time, regardless of the needs of labor. The fact that it would

also serve just now to relieve distress should not unduly prejudice conservative minds against it. In the San Jacinto and Pleasant Valley Irrigation district there are now 1,000 inches of water flowing in the pipes, and but 2,000 acres of land under cultivation. The water taken from Santiago creek by the owners of the San Joaquin ranch is reducing the flow to such an extent that ranches below dependent upon it are suffering. Many of the alfalfa fields have been abandoned, the trees requiring all the water available. The San Joaquin people are taking fully one-half of the water. Legal proceedings will be instituted at an early date to restrain the owners of the big ranch from taking the water. It is now announced that the bonds of the Escondido Irrigation district have been sold to Mr. Putnam, of New York, and that construction of the system will begin in a short time. As soon as work on that begins the extension of the Pacific Beach railway from La Jolla to Escondido is expected to be begun.

Oregon.—The Three-mile Falls Irrigation Company's enterprise near Umatilla is now nearing completion. The water is taken from the Umatilla river at Three-mile Falls. The ditch is five miles long, and will carry about twenty cubic feet of water per second, sufficient to irrigate 1,500 acres of the sandy soil in that locality. An orchard of 8,000 or 9,000 trees, mainly prunes, is already set out.

Nebraska.—NORTH PLATTE.—Lincoln county is just now reaching out after a fair division of surface water. President I. A. Fort, of the State Irrigation Association, is indefatigable in pushing the work of organization. In this county ditches aggregating nearly 150 miles in length are already in process of construction. The proprietors of the Meeker irrigation ditch offer to furnish water free for the purpose of watering trees that are planted along the highway under their ditch. All the irrigation ditches in the vicinity of Benkelman are now running in full blast with plenty of water, and are doing good service to their owners. A contemplated improvement in the Minatare canal which is receiving a good deal of discussion down that way is the building of a new headgate this fall, and it is also urged that it be moved a half mile up the river in order to get more fall. This work, if done, will not be until fall, and it is expected that some enlarging will also be done. The Holland ditch is now furnishing plenty of water with which to irrigate gardens, lawns and trees. Care should be taken not to use too much water. The irrigating ditch begun at Rushville is mapped out for a distance of 200 miles, and will cost nearly \$2,000,000. Work on the Torrington ditch is progressing rapidly, and they had the luck to have two breaks in the ditch the first week through the gopher while testing the water to see if was fit to produce a few ears of corn for them next fall. The North Platte Irrigating and Ditch Company held their annual meeting this week, and elected a new board of directors: Augustine Mason, president; William B. Coy, secretary, and William G. Curtis, treasurer. It is expected that the ditch will be placed in excellent running order before another year sets in. Work is shut down on the Nine-mile canal just now, the interested farmers being engaged in farm work. They are getting considerable water to use from seepage, although the headgate is not in yet. Before constructing the headgate the officers of the company will make a pilgrimage in a body up the river and inspect the various gates, in order to get the benefit of others' experience in this line. KEARNEY.—The \$60,000 bonds voted at last election for the widening and deepening of the canal to 9,000 horse power are now in the hands of the printer, and will be signed up and ready for the auditor to register the last of this week. The fact that this money will soon be put in circulation and that the canal will be so enlarged has inspired the citizens of Kearney with the old-time "gait," and already there is talk of building a handsome pavilion on the shores of Lake Kearney.

Colorado.—The High Line Reservoir Company at a late meeting of the board of directors agreed to amend the articles of incorporation increasing the capital stock to \$300,000. A new

rule was adopted, whereby stock in the company will be sold to any one desiring to secure water from the canal.....The late heavy rains burst the banks of the Eaton ditch near Dry creek, northwest of Fort Collins, carrying away about forty feet of the bank. A large gang of men was set to work on the break and the necessary repairs were completed, and water is again running in the ditch.....DENVER.—Receiver for a Denver Water Company—Austin G. Gorham has been appointed receiver of the Denver Land and Water Storage Company, on application of the State Trust Company, of New York. It has defaulted on interest. The franchise is estimated to be worth \$1,000,000, the dam and ditches cost \$489,000, and the company own 17,000 acres of land. Manager Alexander says the company will come out all right.

Washington.—The prospects for the immediate construction of the Middle ditch were never more hopeful than at the present time. As the time draws near for the opening of the bids for the purchase of the \$200,000 issue of bonds, correspondence is pouring in from every direction relative thereto. The attitude of capital is favorable to the enterprise and the directors are encouraged to believe that when they meet in June something definite will be known, if indeed the bonds are not sold at that time. The building of this ditch means the opening up of 20,000 acres of choice farm land, more than doubling the present area now in cultivation in the valley. Irrigation has been practiced here just enough to prove it a grand success. It has served to bring barren sage brush land to the highest state of production, in fruit, cereals and everything known to agriculture. It has proven a success as an investment for capital, and has made farming successful wherever water is used.....WENATCHEE.—There are a number of parties expected who contemplate building a large irrigation ditch. It is believed that the enterprise will be carried forward, which will be a great benefit to the country around about Wenatchee, and will add many thousands of dollars to the trade of the business men of the town.

Idaho.—A. J. Crook says work will be commenced shortly on the extension of the Last Chance ditch in the Payette valley. The promoters of the enterprise are now considering the estimates, the lowest of which is \$40,000.

Utah.—A report from Rock Springs says the capitalists of the flourishing towns of Rock Springs and Lander will construct an irrigating canal in the immediate vicinity of the latter town. The canal will issue from Popoagie river, will cover 12,000 acres, and will be completed during the present year.

NEW COMPANIES.

New Mexico.—Certificate of the Northwestern Colonization and Improvement Company, of Chihuahua, filed, designating the principal office of the company at Cleveland, O., and the principal place of business, Deming, N. M., and naming Gustav Wormser, of Deming, as agent, upon whom process may be served.

Utah.—The Beaver Valley Land and Irrigation Company has filed articles of incorporation. The object of the corporation is to conduct the business of supplying water for domestic, municipal and manufacturing purposes, and for the irrigation of land; also to construct and maintain reservoirs, canals, ditches, etc., together with necessary dams; also for the colonization, development, purchase and sale of real estate, and of water and water rights; also the building hotels and bath houses.

Nebraska.—Carl E. Elving, Claes A. Elmen, G. Albert Brandelle, Marten Noyd, Victor E. Johnson, Charles Ortuund and E. B. Rood have incorporated "The Swedish-American Colonization Company," of Omaha, Nebraska, to transact a general real estate business; to act as a bureau of information to homeseekers, induce immigration, and to secure manufacturing and business enterprises for towns and cities. Capital stock, \$25,000.

California.—Pasadena—Pasadena Highland Fruit Association, dealing in fruit, incorporated. Capital stock, \$50,000.....

San Francisco—The Consumers Water Co., incorporated by A. G. Wheeler, C. E. Grosjean and Chas. Orpen, of San Francisco. E. L. Fitzgerald, of Berkeley, and F. L. Van Meter, of Alameda. Capital stock, \$1,000,000.....Hanford, King's County—Upper Limeburger Slough Co., incorporated by Timothy Page, of San Francisco, John McAdam, Charles Latham and W. A. Long, King's County, Don Ray, of Galt, H. I. Rider, of Kingston, and C. W. Henderson, of Fresno County. Capital stock, \$10,000.Pasadena—Pasadena Highland Fruit Association, incorporated by C. C. Thompson, C. E. Tebbetts, L. S. Porter, Byron Lisk, J. R. Clark, R. Cooley and Joseph A. Smyth. Capital stock, \$50,000.

Washington.—Spokane—Cascade Development Co., incorporated. Capital stock, \$500,000.....Tacoma—Western Bay Land Co., reported as having received deeds for \$59,388.....Vauqn Bay, Pierce County—Vauqn Bay Fruit Growers' Co., incorporated by Geo. H. Bassett. G. W. Bradley, G. W. Pater, N. N. Davidson, for the maintenance of a horticultural library. Capital stock, \$5,000, in 1,000 shares of \$5 each.

Kansas.—Cherryvale—The Cherryvale Water Co., incorporated by J. C. McMurray, Worcester, Mass.; J. C. McIntosh, Springfield, Mass., and others. Capital stock, \$30,000.....Salina—The Kouns Manufacturing Co., incorporated by Wesley Kouns, E. S. Fitzpatrick and others, to manufacture windmills and pumps. Capital stock, \$50,000.

Texas.—The Kitchen Irrigation and Manufacturing Co., of Menard county, has been chartered. Its capital stock is \$2,000, and the directors are F. M. Kitchen, J. L. Alexander and William Menzie, all of Menard county.....Hillsboro—Sporger & McLeod awarded contract at \$7,700 to put down an artesian well 2,000 feet. A company is being organized to own and control the well.....San Saba—San Saba River Irrigation Co., incorporated. Capital stock, \$250,000.....Atlanta—Atlanta Immigration Bureau, incorporated. Capital stock, \$2,500.....Hempstead—The Hempstead Water Works Co., incorporated. Capital stock, \$20,000.

Colorado.—The Glenwood Orchard and Irrigation Co. has been incorporated to colonize the fruit lands lying under the Hallett canal. These embrace about 7,000 acres of the finest lands along the Grand river, between Rifle and De Beque, for thirty miles. They are to be divided into tracts of ten acres each, and are eminently adapted to the growth of all varieties of fruit.Denver—Farmers' High Line Canal and Reservoir Co. filed amendments to the articles of incorporation. Capital stock increased to \$75,000, and made assessment.....Denver—New York Breenlow Land Co., incorporated. Capital stock, \$10,000.Elias P. Collins, S. J. Collins and Frank Collins have incorporated the Collins' Reservoir, Drain and Irrigation Co. to operate in Larimer county with \$600 capital.....Denver—Cheyenne Land and Canal Co., incorporated by John M. Patterson, Elizabeth P. Slattery, Geo. B. Slattery and Orland J. Greer, of Kit Carson. Capital stock, \$10,000.Denver—The Cross Cut Ditch Co., incorporated by U. M. Henderson, F. F. DeRush and O. J. White, with a capital stock of \$5,000.....Denver—The Utica and Colorado Land Co., incorporated by Chas. E. Cooper, Edward P. Pawin and Charles M. Kendall, with a capital stock of \$36,000.....Denver—The Badger Engineering Co., incorporated. Capital stock, \$100,000.....Crystal—The Crystal Mountain Mining and Drainage Co., incorporated. Capital stock, \$2,000,000.Fort Lupton—The Lupton Bottom Ditch Co., incorporated, operating irrigating canal. Capital stock, \$8,300.....Colorado Springs—The Beaver Creek, Altman and Victor Reservoir and Pipe Line Co., incorporated. Capital stock, \$100,000.....Delta—The Delta Orchard Co., incorporated, planting orchards, etc. Capital stock, \$25,000.

Washington, D. C.—The Bureau of the American Republics is informed that the plans of the North Peru Company, South America, for the irrigation of the valley of Piura have been approved. The scheme involves about \$5,000,000 of American capital.

BEAR VALLEY MATTERS.

EX-PRESIDENT GREENE WRITES AN OPEN LETTER TO THE EDITOR OF "THE AGE."

CHICAGO, June 13, 1894.

Wm. E. Smythe, Esq.,

Editor of THE IRRIGATION AGE, Chicago, Ill.:

DEAR SIR: I have before me the June number of your journal, containing an article which I understand to be a semi-official announcement of a plan for reorganization of the Bear Valley Irrigation Company, which has been in the hands of receivers since December of last year.

You seem to have carefully ignored any statement of the causes which led to this great disaster, thereby denying to shareholders any consideration of the reasons which have led to the adoption of the plan as presented. The time occupied in reaching your conclusions, and for carrying on the negotiations, has, I think, been ample to have permitted the promulgation of something more satisfactory.

It is quite true that the Bear Valley Company won the confidence of the investing public. How widely that confidence was disseminated will appear from an analysis of the stock list as given below. You make, as a statement of fact, that "Bear Valley obtained for its own and dependent companies something like \$3,000,000. This came in part from New York and the New England States, and in part from foreign countries, principally from England, Scotland and Switzerland." It will interest

shareholders, perhaps, to know just where it did come from, and I submit an analysis of the lists of shareholders of the several classes, as of date, May 3, 1893, since which time there have been comparatively few transfers.

There are 20,000 shares held *en bloc* by the Bear Valley and Alessandro Development Company, as the equivalent of an equal number of shares issued by that company. Besides these there are 10,000 shares outstanding of the common stock, and about half as many of preferred.

ANALYSIS OF THE TABLE.—Represented by percentages, there are held of the total in the United States, 74 per cent.; in England, 6¼ per cent.; in Scotland, 13 per cent.; in Switzerland, 5½ per cent.; less than 2 per cent. being held in British provinces.

The number of the shareholders of common stock (\$1,000,000) is 387; of the preferred stock, 193; of the Development stock, 149. Total number of shareholders, 729.

Of these, 71 hold but a single share each; 58 hold 2 shares; 216 hold 5 shares or less; a little more than half of all, 369 individuals hold less than 10 shares; 133 hold from 10 to 19, inclusive; 104 hold from 20 to 49, inclusive; 37 hold from 50 to 99, inclusive; 58 hold from 100 to 499, inclusive; 6 individuals and 4 companies hold above 500 shares each.

On page 226 of THE AGE you speak of the Company as being floated on the "still-hunt plan, and about which investors made

TABLE, SHOWING DISTRIBUTION OF SHAREHOLDINGS IN THE BEAR VALLEY IRRIGATION COMPANY.

WHERE HELD.	COMMON.		PREFERRED.		DEVELOPMENT.		TOTAL.
	Holders.	Shares.	Holders.	Shares.	Holders.	Shares.	
California	24	708	8	451	57	13,241	14,460
Connecticut	109	840	108	1,424	62	3,425	5,689
Massachusetts	102	1,163	21	127	14	1,839	3,129
New York	36	710	7	143	10	888	1,746
Rhode Island	13	138	2	7			145
Ohio					1	30	30
New Jersey	6	60	3	40	2	49	149
Vermont			1	1			1
Illinois	1	25	1	100			125
Iowa					1	18	18
Nebraska	1	40					40
Wisconsin			1	2			2
Wyoming	1	5					5
Arizona					1	8	8
Minnesota	1	5					5
Maine			1	10			10
Canada		35			1	5	40
Malta	3	100					100
Germany	2	253					254
Switzerland	1	1,058	1	889			1,947
England	29	1,441	13	748			2,189
Scotland	57	3,501	25	997	1	100	4,593
Totals	387	10,142	193	4,945	149	19,603	34,690

NOTE.—There is an apparent excess above the 10,000 common, but it is clearly an error, as the exact number as issued is registered by the Registrar. There are also 397 shares of the Development stock unaccounted for in this list, of which a part is held in Switzerland. While all of the Swiss holdings stand above as in the one name, they are in fact distributed among a number of holders.

no inquiry from disinterested sources.* Nothing could be more unjust or further from the truth. From the first offering to the last there was the most thorough publicity. More than a half million publications were distributed; the public press of New England, and wherever else the stock was offered, was largely used, and the most thorough investigation was invited, everywhere and always. A large party of agents and investors was taken to Redlands, and spent a week looking over the entire works and over all the territory to be reclaimed. Examinations were made by experts, and, at the instance of investors, often and over again, and the sales were made to many of the most careful and experienced investors and financiers of this and other countries.

In fact, your own admission that the Bear Valley enterprise was so constantly quoted, and exerted so great an influence in attracting the attention of investors to this class of securities, is a flat contradiction of the statement and innuendoes referred to.

The result of each and every examination, with the one notable exception by Mr. Crouch, was the same, and now the united opinion of all who have previously examined it is confirmed by your announcement that a jury composed of "keen European minds, representing the most conservative element of foreign investors; men of ripe judgment from Eastern States, accustomed to rigid standards in the estimation of values and earning capacities; men of large affairs from Chicago, who are in the habit of penetrating financial propositions to the core; Californians thoroughly familiar with all the local conditions related to the value of land and water; lawyers specially skilled in the legal questions involved in the complicated affairs of the Company and the plans proposed for its reorganization; still other parties brought to its councils broad knowledge of irrigation in its world-wide aspects, and were able to compare this typical enterprise with all others of prominence in various Western States and Territories. This was the character of the jury which passed upon the merits of Bear Valley, and weighed in its scales the various elements which enter into the problem of irrigation investments. *The examination was thorough, rigid and merciless.* The result, as will be seen, was the triumphant vindication of irrigation securities as a class."

Then, to make the application more direct, you go on to commend the special features of the Bear Valley Company's works—its "bold and successful engineering," "the character of the irrigation methods it has introduced—the most perfect in the world," "the character of the communities which have been built up under these beautiful canals." Then you prove the high value of its water supply—conclusively, I think—and estimate the value of the lands which the Company owns with a view to their reclamation, putting upon it a higher valuation in the assets than I have ever represented. Your statement of the earning capacity of the Company fully confirms my judgment and representations.

It is gratifying, indeed, to me, to see Messrs. Allen and Davidson directly committed to estimates which were controverted by Expert Crouch, upon whose report the action was taken which precipitated this catastrophe.

Naturally, no one will find a deeper interest in your discussion of these statements than myself. The original plan of the Bear Valley organization, as published in the Redlands *Orange Belt* for December, 1890, and published by authority of the directors of the Company, was mine, and I am proud to claim it. It was not the fulfillment of but the departure from its contract promises, and the utter disregard of the obligations the directory assumed which is responsible for the unfortunate collapse. The principle enunciated is a very simple one—that construction shall be provided for from the sales of the capital stock alone; that earnings from all sources shall be subject to the

charges for maintenance, and any surplus shall be divided among the shareholders, subject to reinvestment at their pleasure. And it is a correct principle which has been affirmed and approved by the opinions and acts of leading financiers in this country and Europe.

Upon the representations then made to me by the leading directors and officers of the Company, the capital provided for was considered ample for all construction necessary to fulfill its contracts with the districts and individuals, and for a considerable additional water supply.

It was clearly stated that the capital of \$4,000,000 would provide for the purchase of the property as it then stood, with \$2,400,000 of the common stock. The property as transferred to the new Company scheduled at a cost valuation as much as the total of the stock, and, if valued on such a basis as you now adopt, would have amounted to more than double the amount paid for it.

The balance of the stock, \$600,000 of the common and \$1,000,000 of preferred, was to be sold to realize the funds for construction. I was employed to make the sale because of my experience and previous success and standing. My contract was in no sense a secret one. The commission allowed—15 per cent.—was publicly known; it was not excessive, because I paid from it all advertising and traveling expenses as well as sub-commissions. The latter were uniformly 5 per cent. to local agents, and 2 per cent. additional to general agents, all advertising for their benefit being paid for by myself, in addition to the cash commissions named.

How successful I was in selling the stock is attested by the above analysis of the shareholdings. That I believed in what I was selling is also attested by the same facts; had it been otherwise, the sales would not and could not have been made. Again I remark, it is exceedingly gratifying to find my judgment so fully confirmed by the verdict of so competent a jury.

It may not matter to you, or to the parties who are managing this scheme of reorganization, what the causes were which led to this disaster, but it is a matter of vital importance for those who see this valuable property slipping out of their grasp just when its value is shown to be so great.

It appears to me that you can hardly escape the responsibility which your relation to the great industry which THE IRRIGATION AGE represents imposes on you by such an avoidance of a disagreeable duty. No one knows better than you what those causes are and where the blame should lie.

You say "there is no difference of opinion concerning the causes of the failure among the disinterested minds who have patiently and conscientiously studied its methods and its history, its value and its prospects. *The Bear Valley Irrigation Company was wrecked by the under-development of its industrial opportunities and the over-development of its stock-jobbing possibilities.*"

Here is the kernel of a very serious charge. Who did it? Who was responsible for it? Why do you avoid the statement and discussion of such facts? Everything done is matter of record. You can place the blame if you choose. You decline to apportion "the credit and discredit which was accumulated in a few brief years of extraordinary financing, engineering and promotion," while you admit that "in the midst of much adventurous speculation and unscrupulous manipulation, there was a good deal of creditable achievement." You choose to make the parties entitled to the credit share in the odium of this outrageous failure. This is not an injustice to me alone; it is especially a wrong to Mr. Hall, whose engineering accomplishments there are in advance of any hitherto achieved in this country, and which have received high encomiums from foreign engineers of large experience and highest professional standing.

You say on page 227: "*Its managers capitalized the future and clipped coupons from their imagination.*" If they did these things there were liable to punishment under the law, and had you examined as to the facts you must have found the statement to be untrue. You have evidently overlooked the fact that such a

*THE AGE stated precisely the contrary. Bear Valley was publicly placed on the market, of course.—EDITOR.

charge was made in a vicious suit in the Superior Court, prosecuted with all the venom which malice and self-interest could prompt, and yet the Company was fully exonerated. An injunction was sought at the same time to restrain the payment of the last dividend which was declared, and, after a most exhaustive examination, the court decided there was no ground for such an injunction.

I assert unhesitatingly that no dividend was paid except from realized earnings and net profits. The property was not over-capitalized in any sense of the term. The offerings of the capital stock were to provide for construction, and the purpose was clearly and honestly stated. The business was conducted on the lines laid down in the original proposition. It was the departure from that representation and contract with me and with the shareholders which has made all the trouble.

Whatever difference of opinion there may be as to the policy of paying dividends after the money raised for construction had been diverted to other purposes than that for which it was specifically obtained, and when the dividend fund was needed or could be used for construction, it could not have been so used without a violation of the contract with the purchasers of the stock—a contract as valid and binding as any other which the Company ever did or ever can make.

The ignoring of all profits as legitimate from the sale of land—net above all cost and expenses—and to insist that the Company had no other source of profit except from annual water rentals is in no sense fair or just, and is contradicted by the present proposition and showing. The realization of profit from such sales was just as much a part of the business for which the Company was organized and empowered by its charter as the delivery of water and its sale directly.

In January you published in *THE IRRIGATION AGE* an open letter from the former managing director, with comments inspired by him that were peculiarly unjust, and when I responded to them you published my communication, but announced that no more should be said through your columns, although you then added to it comments calculated to discredit my statements and distinctly accrediting Mr. Brown. While admitting he had sold all of his stock, you proceed to say that he had evaded no responsibility, "moral or financial." The one he never recognized, and as to the other you will hardly claim now that under California law he did not evade financial responsibility by disposing of his stock.

You said further, upon his authority, that I removed my profits further east, while he had been engaged in a philanthropic effort to protect the people of Redlands, wholly oblivious of the fact that I had purchased the last 200 shares from Brown to help in ridding the Company of him, and the further fact that I had expended more than \$40,000 within the year in the cultivation of the Alessandro lands, at my own risk, and that by reason of the panic, although we harvested a good crop, I suffered a direct loss of more than \$80,000 by it, and the further fact that I had bought 400 shares of the Alessandro Land Company stock, and \$20,000 of the Town Company stock, paying the same net price as paid by all others. All of these stocks I have been compelled to pledge as security, as well as most of my other property, on account of losses incurred through this wrecking disaster—one as deliberately planned and mercilessly carried out as ever disgraced the annals of corporate management in California or any other state. It has been frequently stated that I "unloaded," or sold, my stocks in time to save myself. I take the opportunity to say here that such was not the case. I made no sales after the trouble begun for my own account and protection, but, on the other hand, was a constant buyer, and shall be loser to the full amount of my investments in common with other shareholders.

You have admitted in conversation that you are better advised now than you were then. Why do you not admit it through your columns as an act of justice due? Why do you permit yourself

to be party to placing the odium for others' mismanagement, or worse, on my shoulders, and for their protection?

There have been many illegal acts done—many of them. Why do the perpetrators escape punishment? Your own statement gives grounds enough for an investigation.

Now, let us examine the proposed plan for reorganization. You do not state it fully—only generalize. You say the capitalization of the new Company is to be \$4,000,000, and, by your own showing, sustained by that of your very expert jury, it will not be over capitalized. But will it not be pertinent for me to ask, "Why if the future was capitalized before it will not be now?"

You announce it will require \$1,250,000 to pay the indebtedness. Shareholders will probably ask: "How is the liability so much increased above the amount said to be due when the Company went to the receiver?" Who will have the benefit of this increase when the payment is provided for, and what does it represent as returned to the Company, if anything? It is quite likely that I am not regarding my own interest in asking these questions no more than I regarded it in giving a year of faithful and onerous service in hopes of protecting the shareholders who had trusted me.

You say that from the beginning of the negotiations it was the purpose and effort to formulate a plan which would enable those who had made a genuine investment in the old Company to protect themselves and share in the benefits and profits of the new enterprise. You do not state the terms on which they can share, but from Mr. Cragin I learn that the \$2,500,000 of bonds to be issued—one-half to pay the debts and the balance for construction—are to be offered to the old shareholders at par, with a bonus of an equivalent amount of shares in the new Company. Evidently there is no protection in this for those who are unable to double their investment.

You say, "It is probable that nearly all the old stockholders, American and foreign alike, will become stockholders in the new company." As there is outstanding \$3,500,000 of old stock, and only \$2,500,000 of bonds to be issued, the query suggests itself, how can it be done? Then, again, it is proposed to issue \$4,000,000 of the new stock. If only the equivalent amount of that is given to the bond purchaser, what becomes of the excess (\$1,500,000)? How is it to be divided? Who will get it, and on what account? Is it possible that the parties who have criticised my commission of 15 per cent. as excessive (which included all expenses) share in this large profit of this reorganization deal—almost 40 per cent.?

These queries are propounded on the supposition that it is the honest purpose to protect the old shareholders, as you announce. If not so, if it is simply a consummation of the original wrecking scheme with the syndicate parties to derive its advantages and profit by the opportunities, then there may be nothing said. They will have the legal right, undoubtedly, to buy it for as little as they can at the auction block and divide it as they choose. There ought to be no pretense of philanthropy under such conditions.

The announcement is a clear admission that when the Company went into the hands of the receivers it had a vast abundance of assets. The statements bearing my signature as president of the Company, and by authority of its directors, have not been attacked or controverted. Except as to the increased indebtedness before referred to, there is no material difference in your showing and mine. Of the \$850,000 then due, nearly or quite one-half would not mature in a year, and \$300,000 not until November, 1895. Your estimate as to requirements for the completion of the plant is practically the same as mine. Your valuations of the property are higher than mine, especially when we consider the embarrassments to follow the discredit of the bankruptcy proceedings.

In a word, there was no misrepresentation on my part as to the condition and the intrinsic value of the property from first to last.

The trouble was that the acts and methods of the directors of the Company—before I took the executive management—destroyed public confidence.

And here I wish to note it was not the directors who staid by it to the end who should carry all the blame. I have really less respect for those who permitted their influential names to be used to secure these investments, all of them profiting either directly or indirectly from the proceeds, who, when they discovered the mismanagement of the Company affairs, hastened to dispose of their holdings to escape responsibility, moral and financial, and to throw upon others the burden of disgrace for which in equity they were equally responsible.

But what can be done about it? It is clear that the property is too valuable to be sacrificed or abandoned, and it is too large for a single individual or for a few to save. My judgment was and is that the better course would have been for the receivers, under authority of the court, to have made assessment for enough to pay the indebtedness upon all shareholdings. Thirty per cent. would have been enough at that time; now it will require forty per cent. on the outstanding stock. It would be a hardship, but would afford better opportunity for all parties to save their holdings. They can easier raise forty than one hundred per cent., and they would have a far better value in their holdings. With the indebtedness paid in full the property would belong to the shareholders who were able to pay, and to others who might purchase the forfeited shares. It would then be a far better security for such bonds as it might be desirable to issue for the completion of the canals, etc. Under such circumstances, \$1,000,000 of bonds, with what could be realized from the sale of real and personal property held by the company, would be an ample amount. The stock would be far more valuable, then, with the smaller amount of bonded indebtedness.

It would be necessary, if such a course should be adopted, to make a distribution of the 20,000 shares held *en bloc* by the Development Company to its shareholders, so they would be put on equal footing with other common shareholders as individuals.

I do not believe that the plan as announced can be carried out. It ought to fail; it is unjust.

In their extended negotiations with the representatives of the syndicate the receivers appear to have overlooked the general shareholders, failing to inform them of the results of their examination as made officially. I think they have made a report to the court, but if it has been sent to the shareholders I have not been advised.

Evidently a leader is needed to represent the shareholders at large, and without good leadership there is not much hope that any effective work can be done. Is it impossible that such a leader can be found? My personal effort in that direction was unsuccessful, the combinations against me being too powerful. Perhaps another who would excite less personal animosity and antagonism from the parties who have been really responsible for this disaster by their criminal or weak management can be found. He ought to be discovered quickly or it will be of no avail.

Respectfully,

CHAS. W. GREENE.

"Water Supply for Irrigation," by Frederick H. Newell, has been received from the Department of the Interior—Geological Survey. It is replete with maps and diagrams. It discusses in detail the Missouri, Yellowstone and Platte river basins. It is a valuable publication for all irrigation organizations.

New settlers on public lands, in the arid regions, especially, should heed a later decision of the Secretary of the Interior. He approves the draft of a circular to be issued soon governing applications for the right of way over public land for canals, ditches and reservoirs. The right is held to extend only to the construction and no public timber or material is allowed to be taken up or used for repairs or improvements. The department ruling of March 21, 1892, holding that natural lakes, already sources of water supply, shall not be used for reservoir purposes, nor shall rivers be dammed so as to cause an overflow into the adjacent country is overruled. All persons settling on public lands to which a right of way has been attached for a canal, ditch or reservoir are required to take them subject to this right.

Interest in electricity in its application to horticulture is increasing in Boston and throughout Massachusetts. The people are anxious to know more upon this interesting subject, and to enlighten them upon these matters, Mr. Bailey, Professor of Horticulture, Cornell University, gave a lecture on electricity and its latest application to horticulture, Saturday afternoon, in the Horticultural Hall, which was attended by a large and deeply interested audience. The lecture proved to be a rich intellectual and scientific treat.—*Exchange*.

INFORMATION WORTH KEEPING.

A miner's inch of water is equal to 9 gallons per minute.

Doubling the diameter of pipe increases its capacity 4 times.

A cubic foot per second is equal to 50 miner's inches, or 450 gallons per minute.

Theoretically, water can be raised by suction 33 feet, but practically only 25 to 28 feet.

A cubic foot of fresh water weighs 62.5 pounds, and contains 1,728 cubic inches, or 7.5 gallons.

Twenty-seven thousand one hundred and fifty-four gallons of water will cover 1 acre 1 inch deep.

Two hundred and twenty-five gallons per minute or 25 miner's inches will be sufficient to cover 1 acre 1 inch deep in 2 hours, 1 minute.

PUBLISHER'S DEPARTMENT.

THE HORTICULTURAL INDUSTRIES OF THE KERN DELTA.

THEY are having a thrifty season in the Kern Delta colonies, California, this summer. The serious drouth in many parts of the State creates an immense demand for alfalfa at high prices. Kern county is an enormous producer of alfalfa, and those of her citizens who have land in this crop will enjoy a splendid prosperity.

Every new settler in Kern Delta should put some of his land into the marvelous forage plant. While this year's demand and prices are phenomenal, alfalfa is always a profitable crop here. Let us look for a moment at other Kern county industries:

THE APRICOT.

Kern county is the apricot's home, and it may be depended upon for a good yield with each returning season. The tree matures early and produces fruit when very young. The fourth year from planting a fair crop will be produced. From that time on the crop increases yearly, and not infrequently the yield is fabulous.

The returns from this fruit will average better than from the peach, the annual net, based upon years of experience, being \$100 to \$150 an acre.

The product may be sold in its fresh state, but it is a better practice to dry it, which may be done at home. The dried fruit, with proper management, should not cost the producer over two cents per pound, and sells at from six to fifteen cents.

THE PEACH.

For the production of the perfect peach Kern county reigns supreme. The trees of all varieties grow with unusual thrift, are remarkably free from disease. They are long lived, bear early and produce large, high-colored, luscious fruit.

A fair yield is often forthcoming at three years from planting in the orchard; at four years good crops are the rule where proper methods of cultivation are pursued. From that time on until the trees are fully matured (eight to ten years) the product increases almost beyond belief. Ten tons per acre is not an unusual harvest from a full-grown orchard.

The profits of peach-growing depend upon conditions that vary more or less each year; \$400 per acre has been realized, and even more, but usually less. Past experience, however, warrants an expectation of a net average of \$100 per acre per annum. The number of trees to the acre varies with different growers from 75 to 108. Young trees cost 8 to 15 cents each.

THE PRUNE

Has not been so extensively grown in Kern county as either the apricot or peach. There are numerous old trees, however, and thousands of young ones have been set in orchard form. The amount of fresh fruit which is born by mature trees would be phenomenal but for its frequency; 1,300 pounds have been taken from a single tree; 300 to 500 pounds is common to trees eight to ten years old.

A desirable quality of the prune additional to its prolific yield is that it is so easily and inexpensively prepared for market. Experts claim that three-fourths of a cent per pound will cover everything. The curing can be done entirely in the open air.

GRAPES.

There is a fine field for profit in growing the various kinds of table grapes for the eastern market. The favored varieties are the Flaming Tokay, Rose of Peru, Black Morocco, Cornichon and Ferrara.

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The first named is very popular. Its bright red color, large size, generally handsome appearance and shipping qualities, which serve to carry it to the market in fine condition, render it popular in the East and enable it to command the highest prices. It is easily grown and produces large crops.

A number of the choicest varieties of foreign grapes are under successful cultivation in the Kern Delta. They thrive in every part of the valley and foothills, and are easily cared for and bring quick returns. Quite a crop is harvested the second year from planting, increasing annually until 15 to 20 tons to the acre are sometimes gathered.

THE RAISIN.

California is the only one of the United States which produces raisins, and no part of the Golden State excels Kern county. Thousands of acres are now planted to the raisin vine, and the quantity and quality of the product are the best.

Raisins are chiefly made from the Muscat raisin grape, but the seedless varieties are extensively grown, produce abundantly, and have paid well.

The process of raisin making is extremely simple. It consists simply of spreading the ripened fruit upon wooden trays and exposing it to the sun in the open air, where it is cured to perfection. When cured, the raisins are put into "sweat boxes" and sold to the packers.

One pound of raisins is made from 3 to 3½ pounds of fresh fruit, and the grower who realizes 3½ to 4 cents per pound for raisins gets a good return upon his capital and labor, while prices in the eastern market warrant him in expecting a much better figure.

OLIVES.

That the olive gives good results in Kern county has been proven by long experience. There are a number of aged trees which have produced heavy crops regularly for years. The many orchards planted later are more than justifying the expectation which induced their planting.

Olive culture is one of the industries of California, and a more promising one no country need desire. The bearing orchards of to-day are bringing uniformly good returns to the orchardist, and the field for production and the market for the product are unlimited.

The trees are easily grown and cared for, are very tenacious of life, withstand much neglect, and will grow upon soil of inferior quality, but better, of course, upon the rich soil which is so abundant here.

THE PEAR.

The popular pear in the Kern Delta, as elsewhere in California, is the far-famed Bartlett. It has a wide

range throughout the state, but nowhere does it more nearly approach perfection than here.

The equable climate during the ripening season, which is exceptional to this locality, frequently brings the entire product of the orchard to maturity with scarce a discernible blemish. The skin is uniform, smooth and waxy, the blush is beautifully tinted, the texture all that may be desired, the flavor superb.

To properly ripen the pear, here as elsewhere, it must be gathered when apparently green and allowed to mellow in the dark. This fact admits of it being packed when in condition to withstand a long shipment, and enables it to reach its destination in prime condition and flavor, and substantially without loss.

In the orchard the trees are set 20 to 24 feet apart, or say from 75 to 100 to the acre. They come into bearing four years after planting, and the product increases year by year thereafter. A mature pear orchard of 20 acres is a competence to a man who gives it deserved attention.

For further particulars about Kern county lands, address S. W. Fergusson, manager, Bakersfield, Cal.

W. W. MONTAGUE & CO.

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The Cut on the left shows a Section of Five joints
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Containing **No Coal Tar**. Iron Coated with this
Composition is Rust-Proof and Rendered Imper-
vious to the Alkalies of the Earth, is Practically
Indestructible.

Iron Cut, Punched and formed for Making Pipe on the
Ground Where Required.

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Short and interesting stories for old and young, by well-known contributors; and, in fact, everything that makes a household paper desirable. At all times the paper is a welcome guest.

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THE HOUSEWIFE, 81 Warren St., N. Y. City.

IRRIGATION HEADQUARTERS, CHICAGO.

The Pecos Valley Irrigation and Improvement Company of Eddy, New Mexico, have opened a suite of offices, Nos. 417-420, in the Chicago Stock Exchange, corner Washington and La Salle streets, Chicago, and will have on exhibition a fine display of irrigated fruits and cereals from the valley of the Pecos. This is a move in the right direction, and will be an accommodation to the public, as anyone desiring information can there obtain it, accompanied by a practical demonstration and proof of the fertility and success of an irrigated farm. The company will be represented in Chicago by Mr. J. P. Massie and a corps of assistants, who will be pleased at any and all times to furnish reliable and accurate information, data, etc. Mr. J. P. Massie is an old resident of that section of the country, and has made irrigation a study and is competent to inform the public, and is at any time ready to receive parties who are or desire to become interested. The Pecos Valley Irrigation and Improvement Company is one of the strongest and most successful irrigation projects in the United States, and has a record that is enviable. We predict that this move will be of benefit to irrigation interests in general. A cordial invitation is given to all irrigationists to make this office headquarters while in Chicago.

1894 HIGH GRADE BICYCLES Shipped C.O.D.
 Anywhere to anyone \$25 Bicycle for \$12.50
 All styles and prices \$75 " \$37.50
 Save dealer's profits \$125 " \$62.50
 Send for large illustrated Catalogue Free
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ADVERTISER WANTS POSITION OF TRUST with Irrigation company which requires a competent superintendent with long experience in handling water, also in vine and tree growing and general irrigation farming. Experience gained in California and New Mexico. Best references as to capability and character. Address, IRRIGATION AGE.

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H. B. WILLSON & CO., Attorneys at Law,
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A new method of mining, milling, roasting and smelting different kinds of ores has been successfully demonstrated in Germany and is now being introduced with unprecedented success. The slow and cumbersome methods heretofore employed, will be discarded, and the cost of various ores in treatment or conversion into metal, especially Lead, Zinc and Silver Ores, Nickel, Cobalt and Copper, greatly reduced. All the matte of the latter, which was heretofore sent to Germany, is now being refined in the United States. **THE HARTSFELD GERMAN MINING SYNDICATE, of NEWPORT, KY.,** invites correspondence. (See their advertisement.)

I Will Get You Settlers.

If your irrigation enterprise is not doing well for the want of settlers, and can pay a salary of \$1,000.00 and 3 per cent. commission on water sales and 1½ per cent. on land sales, try me. I make a business of colonizing and am very successful. Settled 75,000 acres of Government land during 1893. Am thoroughly posted on the U. S. land laws and irrigation of all kinds. I work on a different basis from any one else—one that brings in the settlers. References: present employers. Also refer, by permission, to **THE AGE.** Can begin work on 30 days' notice.

ADDRESS, PRACTICAL IRRIGATOR,

Care of **THE AGE,** Chicago.

EXAMINER OF LANDS.

We make a specialty of examining lands. Intending Purchasers and Colonists will find it to their special benefit to have an expert's opinion before they buy land in California.

Correspondence solicited.

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Bicycles, Watches, Guns, Buggies, Harness, Sewing Machines, Organs, Pianos, Safes, Tools
 Sales of all Varieties and 1000 other Articles.
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MINERAL ORE DEPOSITS now idle for want of funds to develop, can find practical and financial assistance by corresponding with **HARTSFELD GERMAN MINING SYNDICATE, NEWPORT, KY.**

PUBLISHERS' ANNOUNCEMENTS.

Does it Pay to Advertise?

.....



As a rule, it does; it is easy to see that the men who advertise extensively almost invariably succeed in building up a large business. But the question is

Does it pay in The Irrigation Age?

The advertisers who use these columns testify quite unanimously in the affirmative. Consider for a moment why it *must* pay to advertise in THE IRRIGATION AGE.

1. It is the distinctive journal in half a continent, and in that half which must necessarily enjoy the largest and fastest development from this time on.
2. It represents the only large field where the agricultural industry can expand in the United States, and it is good business sense to make a line of goods thoroughly well-known there, with a view both to immediate and future results.
3. The farmers of the arid region are more uniformly prosperous than those who are afflicted by crop failures, and they are therefore more profitable customers as a class.
4. They use more and better goods of all kinds for the same reasons.
5. They are the most intelligent farmers in the world—brains are required to get the best results from irrigation—and they are naturally the first to recognize a good thing.
6. They are confronted on all sides by new problems—How to use water to the best advantage—How to cultivate each acre to get the best results—How to develop the most attractive communities. These problems make them eager to consider and to buy whatever will help them to get ahead.
7. THE IRRIGATION AGE is the *only publication* that reaches this *peculiar field* in a broad way. It is the friend and champion of Western America and has a powerful influence with its field. Every business man who has anything to get before the large, enterprising and multiplying public in Western America should advertise in this journal.

Send for rate card and advertisers' testimonials.

THE IRRIGATION AGE COMPANY,

511 MASONIC TEMPLE,

CHICAGO, ILL.

Publisher's Announcements

The Irrigation Age in the East

DURING 1894...*THE IRRIGATION AGE*...desires to extend its circulation very largely among the Eastern States. It already has a large constituency there, but it should be multiplied many times during the next twelve months. If this is accomplished it will be a benefit alike to Western and Eastern interests. There are thousands of home seekers in the East and thousands of homes awaiting them in the West.

Special Inducements for Eastern Circulation

In view of the benefits to follow the wide circulation of the great Champion of Irrigation among the masses of the East...*THE AGE*...has decided to offer special inducements for that class of circulation.

Write for Special Introduction Terms East of the Mississippi River. These will be granted only when specially requested, so that it shall be an apparent result of this advertisement.

LAND AND WATER ENTERPRISES in the West should also write for special terms for "List of Five" and "List of Ten" TO BE SENT TO EASTERN ADDRESSES. A generous response to the "Club Proposition" will bring better results than any other form of spreading information.

A Monthly Tour of the World

THE KERN COUNTY LAND COMPANY says: "We have frequently called upon the...*IRRIGATION AGE*...to present our properties and ALWAYS WITH GOOD RESULTS."

Every company having desirable Irrigated Lands for sale should follow the example of the most progressive and successful land enterprise in California. There is a great and growing demand for these lands. People write and call every day at the Chicago Office of ...*THE AGE*... Some want lands in Idaho, Washington and Oregon; some in Montana, Utah and Nevada; some in Arizona, California, Colorado and New Mexico.

The general public thinks that an Irrigated Land proposition that does not advertise in the pages of...*THE IRRIGATION AGE*...must be either very dead or very bad.

Why don't you invite your Land Proposition to accompany...*THE IRRIGATION AGE*...in its MONTHLY TOUR OF THE WORLD?

THE IRRIGATION AGE

P. O. Box 1019

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strong, durable and cheap material from which very superior Water and Sewer Pipe can be made. The strongest acids and gases will not affect it. No skilled labor, expensive plant or machinery are required to manufacture it. It can be manufactured where used, thereby saving expensive freights and cartage. Patented March 23, 1894, by CARTER & HINMAN, 223 West Second Street, Los Angeles, Cal. State rights for sale. Correspondence solicited.

J. B. PARKER & CO., 132 South Broadway, Los Angeles, Cal., are the owners and proprietors of this patent for Southern California, and are manufacturing Water and Sewer Pipes; Linings for Irrigating Ditches, Reservoirs, Bathing Houses, Cisterns and Tanks; Ducts for Telephone and Telegraph Companies; Culvert Pipe for Railroad and Road purposes.

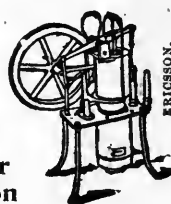
This pipe and material are very much stronger than any in use and cost no more than Cement or Vitrified Pipe. Perfect joints are made with it, and for Irrigation or similar purposes it is superior to any now in use. Grass or tree roots will not penetrate or grow into it as it will into others. Heavy water pressures can be maintained with it. We make no pipe that will not stand 50 pounds pressure per square inch. The pipe is ready to lay within an hour of its manufacture. No burning or drying. For price lists and other information address us as above.

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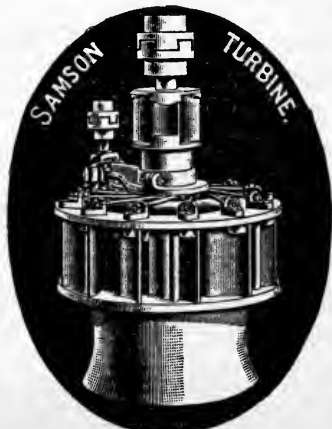
Hot Air Pumping
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The operation of these Engines is simple; a child can run them. They are perfectly safe. They will pump water from shallow streams or any kind of a well.

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WATER WHEELS

140 Styles and Sizes. Upright and Horizontal.

32 YEARS BUSINESS

Affords every facility for adapting them to

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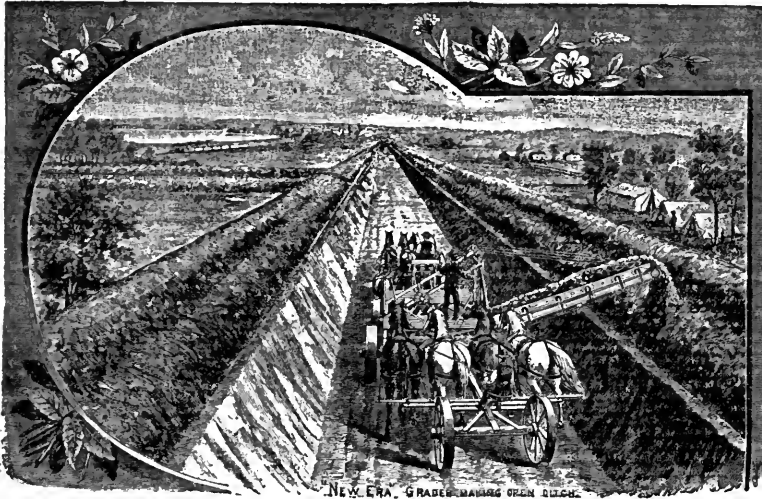
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THE NEW ERA

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Reversible Road Machine,

For Small Laterals

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Wheel and Drag Scrapers,

Rock Crushers and Rollers.

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The Carpenter Water Register.

\$20—\$20—\$20—\$20—\$20

Will buy a Carpenter Water Register.

By making the machines in large quantities and the use of special machinery we are enabled to place this machine on the market at the low price of

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Which brings it within the reach of all.

CAN YOU AFFORD TO BE WITHOUT ONE?

The engineer cannot, the canal owner cannot, and if the farmer uses the Register he can save hundreds of dollars. HOW? Because the ordinary methods of measuring water are inaccurate and he cannot tell to an absolute certainty whether he is receiving all the water which rightfully belongs to him. By the use of the Register he can. It measures and records to a drop the water which passes through the canal night and day.

Remember **\$20---\$20---\$20---\$20** buys a Water Register.

AGENTS WANTED in every Irrigated District throughout the Arid Region. Write for terms and territory.

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The strongest mill ever made. Quadruple Braced Vane Arms. Self adjusting Turn Table, direct lift Pivoted. Flexible Brake. THE PEERLESS MILL will produce power with less attention in a lighter wind and is safer in a gale than any other mill. Write now for agency. Circulars fully descriptive mailed for the asking.

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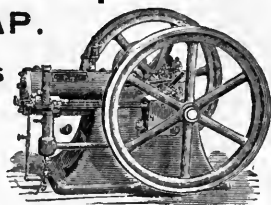
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Irrigated Lands for Sale by The Pecos Irrigation and Improvement Co.
AT \$25 TO \$30 PER ACRE,

On 10 Years' Time, 6 per cent. Interest, \$125 Water Rental.

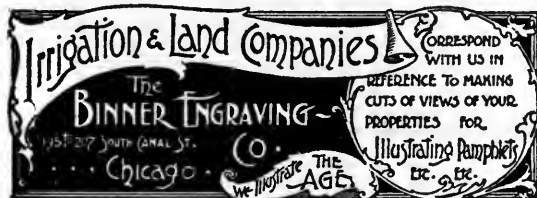
Assured income, increasing values, perfect climate, excellent railway facilities, unfailing market unlimited water supply, good schools, churches—every denomination, cultured and refined society are among the advantages enjoyed by residents of the attractive Pecos Valley, conceded by all to be one of the finest fruit and vine growing regions in the Southwest. It is equally well adapted to general agriculture and stock growing; bees, poultry and hogs are especially remunerative. Call or write for particulars.

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All kinds of tools. Fortune for the driller by using our Adamantine process; can take a core. Perfected Economical Artesian Pumping Rigs to work by Steam, Air, etc. Let us help you. THE AMERICAN WELL WORKS, Aurora, Ill.; Chicago, Ill.; Dallas, Tex.



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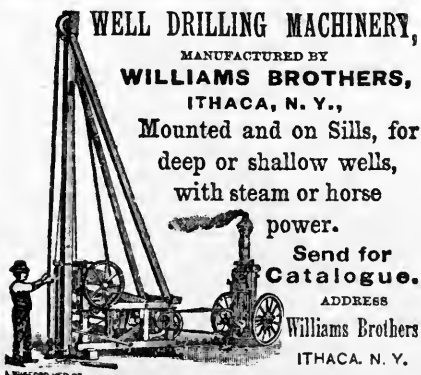
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They are also largely interested in, and call special attention to the 600,000 acres of land in the famous

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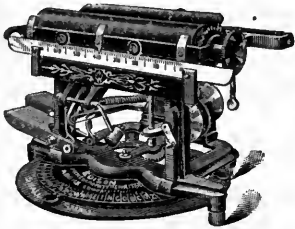
Mounted and on Sills, for deep or shallow wells, with steam or horse power.

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SOMETHING YOU WANT.

Write
us
about
it.

\$22.00
You need
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We sell it.



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The Edison-Mimeograph Typewriter

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It lacks the **HIGHEST** Speed, but is fast enough.
It has steel type. It is a heavy manifold.
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It prints from a ribbon. It is light and portable.
It does **PERFECT MIMEOGRAPH WORK.**
It does as good work as the \$100 machines.

IT IS NO TOY.

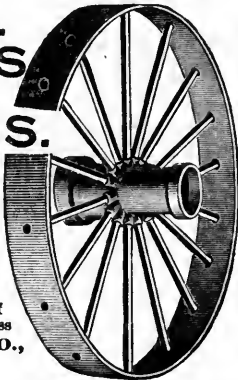
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**METAL
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WAGONS.**

Any size you want, 20
to 56 in. high. Tires 1
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Cost many times in
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of low wheels to fit
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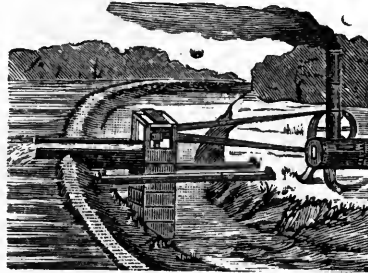
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YOU CAN be independent of canals.
YOU CAN irrigate without them.
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Cobalt, Lead, Zinc, Antimonial Silver,
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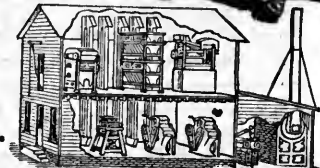
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Do you Grade, or Drain, or Irrigate? If so, you need this Level.

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Recommended by hundreds who have used it, and some of whom
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560 Acres in Nursery. Established 28 Years.
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We do not advertise our stock like a vender of Patent Medicines, but invite correspondence and challenge comparison as to quality of stock and reputation for fair dealings.

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Many persons cannot write Business Letters, Circulars, Prospectuses, Advertisements, Speeches, Essays, or articles for the Press. They employ others to do the work. I have regular patrons in every section of the United States and in Canada. Write Irrigation, Mining, Financial and general Western contributors for thirty prominent publications. I furnish information on Securities, Bonds and other business. Fifteen years' experience in newspaper work. Can do almost any work requiring brains, typewriter and pen. My rates are reasonable. Send for estimates.

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Editor Messenger,

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Is our Tourist Sleeping Car rate for one double berth to Los Angeles or San Francisco from Chicago, and \$8.00 from Eastern Coast on the "Phillips-Rock Island" car that leaves Philadelphia every Wednesday.

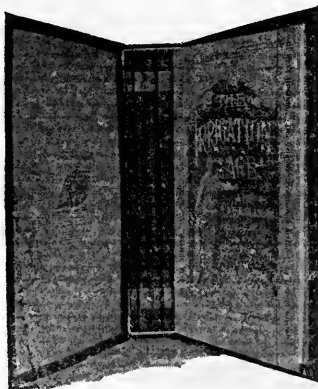
Route is over the B. & O., "Great Rock Island Route" to Pueblo, D. & R. G., and Rio Grande Western (scenic route), and Southern Pacific. Mr. Phillips has been in the tourist business fourteen years, and you will receive the very best service.

Also route from Boston every Tuesday via the Fitchburg.

For that California trip you contemplate, address A. Phillips & Co., either Boston or Philadelphia, Pa.

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G. P. A., "Rock Island Route,"
Chicago.

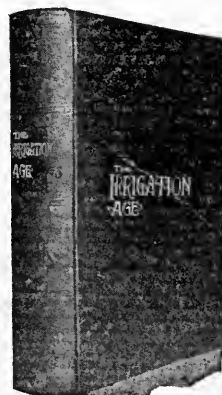
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**The
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In response to a demand for a binder for temporarily holding the current numbers of **THE IRRIGATION AGE**, we have had the National Binder Co. manufacture a special cover for this purpose. It is *attractive in appearance and the back stamp corresponds to that on a regular bound volume. The magazines are instantly and securely held in the covers* by thin steel slats, which run lengthwise through the magazine. *This binder has no equal*, since it is just as attractive when partially as when wholly filled, and does not in the least mutilate the contents. Price \$1.00.

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"The Overland Route,"

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MOST DIRECT LINE

FROM . . .

THE MISSOURI RIVER

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ALL PRINCIPAL POINTS WEST,

And on account of the varied character of the country it traverses, offers to those who contemplate going West a more greatly diversified territory to select from than does any other

TRANS-CONTINENTAL LINE.

Passing as it does through NEBRASKA, KANSAS, TEXAS, NEW MEXICO, COLORADO, WYOMING, UTAH, IDAHO, MONTANA, OREGON and WASHINGTON, every business interest is to be found along its line.

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For pamphlets descriptive of the above named States or Territories, or any information relative to the Union Pacific, call on or address any agent of this Company, or

W. T. HOLLY, Gen'l Agent, 191 S. Clark St., Chicago.

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The only Standard Gauge Route penetrating the heart of the Rocky Mountains.

The only Line passing directly through Salt Lake City to and from the Pacific Coast.

Situated on this line, awaiting settlement, are Homes for Millions of People in a Land Fair and Rich.

THE ONLY LINE

Offering passengers the choice of three routes through the Rocky Mountains, the scenery of either being the marvel of two continents. Running solid trains between Denver, Pueblo and Colorado Springs, and Salt Lake City and Utah. Offering passengers of all classes free reclining chair cars between Denver, Salt Lake and Ogden.

In the development of Utah and her magnificent resources the Rio Grande Western has always taken the lead. See that your freight is routed over the Rio Grande Western Railway, and that your tickets read the same way.

D. C. DODGE, Gen'l Manager; A. E. WELBY, Gen'l Supt.; J. H. BENNETT, Gen'l Pass. and Ticket Agt.

SALT LAKE CITY, UTAH.

Send 25 cents to J. H. BENNETT, Salt Lake City, for copy of Utah, beautifully illustrated.

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IN
3½ DAYS

FROM CHICAGO.

Variable Route

Tourist tickets allowing privileges never before accorded, can be obtained with full information, upon application to any ticket agent, or to the General Passenger Agent, CHICAGO.

All meals served in Dining Cars.

Palace Drawing-Room Sleeping Cars and Tourist Sleepers are run through to San Francisco without change, leaving Chicago daily via the

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"Scenic Line of the World."



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The Popular Line to
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Reaching all the principal towns and mining camps in Colorado, Utah and New Mexico.

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All through trains equipped with Pullman Palace and Tourist Sleeping Cars.

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DENVER, COLORADO.

HOMES AT SMALL COST IN WYOMING.

A PRACTICAL AND SUCCESSFUL IRRIGATION ENTERPRISE.

A PLAN of colonization, the success and practicability of which has been determined by actual results, may be found at Wheatland, Laramie county, Wyoming, where the Wyoming Development Company has provided the means by which at least six hundred families may be furnished homes and a sure way of obtaining not only financial independence, but a reasonable degree of affluence.

The following facts inform the home-seeker where these homes may be found; how they may be obtained; some of the advantages of owning them; how much they cost, and give some general informa-

tion of the surroundings, all of which may be verified and substantiated by a personal visit of the home-seeker to Wheatland, where he can see for himself and learn from the lips of the settlers who have preceded him just what has been accomplished in the short time Wheatland has been opened to the home-maker.

Denver & Gulf railway system. Fifty-eight miles north at Orin is the Cheyenne & Northern junction with the F. E. & M. V. branch of the Northwestern railway system. Twenty miles to the northeast is the Hartville mining district, containing the largest and richest iron deposits of the West. Seventy-five miles north are the oil fields of Casper and Douglas, from which during the past two months shipments of oil to market have commenced over the Denver & Gulf railway system. The surface of the lands is slightly undulating, the elevation above sea level varying from 4,500 to 4,700 feet. Along the western line of the lands extends a range of the Black Hills heavily timbered with pine.



VIEW OF A CURVE ON CANAL NO. 2.

tion of the surroundings, all of which may be verified and substantiated by a personal visit of the home-seeker to Wheatland, where he can see for himself and learn from the lips of the settlers who have preceded him just what has been accomplished in the short time Wheatland has been opened to the home-maker.

LOCATION AND SURROUNDINGS.

The lands in question comprise 60,000 acres, all patented and owned absolutely by the Wyoming Development Company. They are about ninety miles north of Cheyenne, the capital of Wyoming, on the line of the Cheyenne & Northern branch of the

CHARACTER OF SOIL.

The lands are admirably adapted for cultivation by irrigation, being slightly rolling with just about sufficient grade to carry water freely. They require no clearing having formed for years natural grazing lands on which rich bunch and buffalo grasses have grown in abundant supply. The soil is a sandy loam and clay and is uniform in quality over the entire tract. From 400 to 600 acres have been under cultivation on various parts of the tract for the past six years, and 1,500 acres have been put under cultivation this year. On the parts which have been farmed previous to this year there has never been a

ADVERTISING SUPPLEMENT.

short crop, while on the 1,500 acres cultivated this season indications are that even on sod land full crops of alfalfa, potatoes and oats will be raised, demonstrating in a most practicable manner the richness of the soil and its productive qualities.

AN AMPLE WATER SUPPLY.

Water for irrigating these lands is abundant. The Wyoming Development Company is the owner under Wyoming laws of water rights which entitle it to the use of the waters of the Laramie river at a point where the volume of water is 6,000 cubic feet per second at its maximum which is in the irrigating season. At this point a stone dam, 150 feet across, is constructed and sluices and head gates of great solidity and strength erected. From the dam the water is first taken through a solid rock tunnel 8 feet wide by 7 feet high and 3,100 feet long under the mountain range lying between the Laramie River valley and the company lands. At the tunnel exit the water is turned into Blue Grass creek, which in turn flows into the Sybille, and is conducted down the natural water courses formed by the channels of these streams for a distance of twenty miles to the Wheatland lands over which it is distributed by canal number one which is 35 miles long, canal number two which is 20 miles long and between 120 and 150 miles of laterals. These will be augmented this year by canal number three 8 miles long and 50 to 60 miles of laterals.

The canals are 25 feet wide on the bottom and carry 4 feet of water. They have been constructed under direction of State Engineer E. S. Nettleton, of Colorado, and Mr. J. A. Johnston, of Wyoming, two of the best hydraulic engineers of the west, and are substantial and permanent in character. The head gates are built with heavy timbers and all parts of the system being constructed with a view to permanency few repairs are necessary. From the tunnel exit to the heads of the ditches the water being carried in the Blue Grass and Sybille creek channels no repairs will ever be required.

The system also includes two large storage lakes formed in natural reservoirs and needing but low dykes to retain their waters. One of these covers 300 acres and is 54 feet deep; the other covers 600 acres and 60 feet deep. Although the quantity of water taken directly from the Laramie river is sufficient to irrigate the entire tract of land without drawing upon the supply in the lakes they will be kept filled permanently as storage reservoirs ensuring abundance of water should there ever be a year of drought of such severity as to affect the water supply of the Laramie. That such a state of affairs should ever exist is doubted as the Laramie river sources are in the perpetual snow fields of the Rockies and it is fed by countless mountain streams of unvarying quantity.

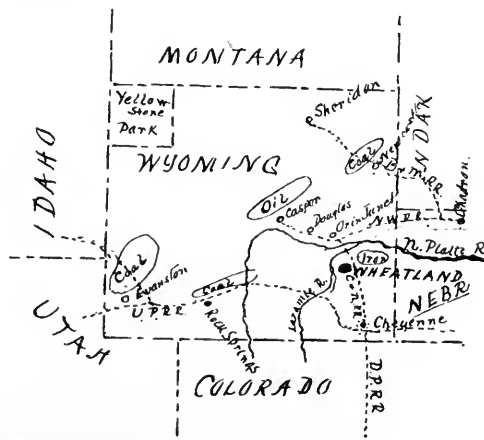
CROPS BEING RAISED.

Six hundred acres of the company's land have been farmed for the past six years and a government experimental farm has been conducted on a forty-acre tract of the property for three years. The results from both are convincing proof of the statement that the lands are productive and that large crops of alfalfa, grains, and roots of all kinds can be successfully produced.

Alfalfa, the great money-making crop of the West, does remarkably well. Three crops are produced each year. The first is cut the latter part of June; the second early in August; the third, about the middle of September. One irrigation only is needed for each crop. The production averages four tons to the acre for each season, although this year four tons per acre were cut for the first crop on an acre in the experimental farm. There is a good market for all that can be raised. Owners of range stock buy all they can get and pay good prices. Five and six dollars a ton in the stack has been the price for several years. Owners of range cattle, instead of being forced to send their cattle to the Nebraska feeding farms to be fattened on alfalfa and grain prefer to buy at home, and a market is insured for every ton of alfalfa that can be grown in Wyoming.

Oats yield 30 to 60 bushels to the acre. Several hundred acres have been cultivated annually on the company's farms. Two to three irrigations are required. The straw is short, but the grain and heads are heavy. Prices are good. Last year's crop sold for $1\frac{1}{4}$ cents a pound on the farm. Numerous experiments on the experimental farm have demonstrated that the best varieties are Early Archangel and Giant Side. A fair stand of oats has been obtained this year by several settlers, who planted it on the sod which was harrowed, but not ploughed.

Wheat yields 25 to 40 bushels to the acre. Winter wheat does not do well on account of the light snow



HOMES AT SMALL COST IN WYOMING.

fall, but spring wheat is always a good crop. White Russian, Velvet Chaff, Blue Stem and Saskatchewan are good varieties for the country. As 95 per cent. of the flour used in Wyoming is shipped in from other states, it is apparent that the market will be good in the state for wheat growers for a great length of time.

Winter and spring rye yields 30 bushels to the acre. One irrigation only is required. Experiments with the grain for the past three years show it to be a certain crop and one produced with but little care.

Flax yields 16 bushels to the acre. It requires two irrigations. That raised on the company's land last year took the first prize at the World's Fair.

Barley of the best quality is raised. It requires two irrigations and yields 25 to 40 bushels to the acre.

Beauty of Hebron and Hoffman are found to be good varieties for which the Wheatland soil is especially adapted. There is always a good market. The 1893 crop netted 75 cents per hundred pounds. During the big strike and tie-up of most of the railroads of the country the Wheatland farmers who had potatoes commanded 4 cents a pound for them.

Field beans produce 20 bushels to the acre with but one irrigation and little cultivation. Field peas produce 22 bushels per acre.

Broom corn grows splendidly. The Japanese and Imperial Evergreen are good varieties, growing to a length of twelve feet with fine, smooth brush.

All grasses do well except red clover which is inclined to winter kill. Broom and Johnson grasses produce good stands and grow rank. Timothy, Rye and Blue grass produce well, but not such heavy



CUTTING A FIRST CROP OF ALFALFA.

Corn yields 40 bushels to the acre. The fodder is small, but the grain is large and matures early. About 40 acres have been cultivated annually for a number of years on the company farm and constant experiments have been made on the experimental farm to determine the best varieties. The market is unfailing as there is a constant demand for corn by cattle raisers for fattening stock.

The potato crop is a big money maker. They do better on the Wheatland lands than in the famous Greeley district where many farmers have become rich by raising potatoes. The yield is 100 to 400 bushels an acre. No fertilizers are required and but comparatively little water, two irrigations only being needed. Alfalfa land ploughed under raises enormous crops of potatoes of the finest quality. On the experimental farm fifty varieties are being tested. Mammoth Pearl, Rose Seedling, Empire State,

crops as on low lands. Millet with a small amount of water is a good grass to cultivate.

Sorghum has been raised on the experimental farm, growing ten and twelve feet high with the cane well filled. It has never been tested for quality.

SUGAR BEETS.

Sugar beets have received much attention on the experimental farm and good crops have been raised for three years. Here, as elsewhere, they require much care in cultivation and considerable water is needed for irrigation early in the season but very little at the close. Twelve to twenty tons per acre has been the average annual crop. With cost of seed, ploughing, irrigating and all other labor the cost per acre of production has been about \$25.

The Wheatland beets are of the finest quality. Tests are made of the products of experimental

ADVERTISING SUPPLEMENT.

farms, from all states where they are established, by government officials. The report of the Secretary of Agriculture on the result of these tests shows that the Wheatland beets are richer than any others produced in the United States, containing 22.09 per cent. of saccharine matter, which is 5 per cent. above the average. While comparatively isolated from the sugar beet market at the present time there is no doubt that if sugar beet raising is undertaken on the Wheatland lands on a large scale a factory within profitable shipping distance will be erected.

Mangel Wurzel and other stock beets produce 40 tons to the acre. Carrots produce 20 tons and all stock roots do proportionately well. These are profitable crops for farmers who combine stock raising with farming, enabling them to fatten stock and put it on the market at any time during the year.

Watermelons are grown successfully and find a ready market at good prices. They are of fine flavor and weigh 30 to 50 pounds.

Strawberries, gooseberries, red and black currants, raspberries and blackberries have been raised on the experimental farm with great success for three years.

Plum, cherry, apple and pear trees have been cultivated for three years and are now bearing. With no special attention all of these trees have done well and will be good producers.

Experiments with tobacco, sweet potatoes and peanuts show that all can be successfully cultivated and all, with the exception of tobacco, profitably.

Tomatoes, cabbage, onions, cucumbers and all small vegetables have been successfully cultivated for three years and a ready market is at hand in Cheyenne and Douglas for all vegetables at good prices.

PROGRESS OF SETTLEMENT.

The Development Company lands were put upon the market in February last. A number of Colorado farmers living on rented farms in the Greeley and Eaton irrigation district were immediately attracted by the advantages of the Wheatland tract and during February, March and April about 13,000 acres were sold to them in farms varying from 40 to 160 acres. A number left their rented farms at once and settled at Wheatland, there being about 60 actual settlers at the present time, who are cultivating their farms. A number decided to remain in Colorado this season, but will break the sod this coming fall on their Wheatland farms, and move on to them at the close of this year's contract with their lessors.

All of the settlers who have farmed at Wheatland this year are, without exception, pleased with their new location, and satisfied they have laid the foundation for future prosperity and contentment. Although getting their seed in late, they will have full crops

and will make even the first season's work profitable. All are practical irrigators, and familiar with the climate and soil. They are delighted at being in a district where water is so abundant as under the Wheatland system.

COMPACTNESS OF LANDS.

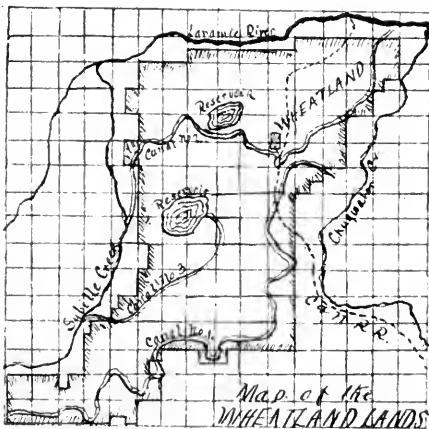
The compact form of the Wyoming Development Company tract is of great advantage to settlers. Quite often irrigation districts and colony sites are in long narrow strips extending along river bottoms or valleys. The Wheatland tract is compact and almost square in form. Short hauls to and from the railway station and to and from town are beneficial results. Schools and churches convenient to a large number of the settlers can be built, and all the advantages of close community and neighborly intercourse be obtained the lack of which sometimes makes farm life dreary and monotonous.

THE EXPERIMENTAL FARM.

Having the experimental farm on the company lands is of incalculable benefit to settlers. The farmer need make no experiments. What to plant, when to plant, how to irrigate, what are the best varieties of seed, what are the most profitable crops, may all be learned without cost. Accurate records of the time of planting, quantity of water required for irrigating, and the results of cultivating all varieties of all kinds of crops have been kept since the establishment of the farm and are at the disposition of the public. From the outset settlers are protected from loss by mistakes in choice of seed by having the experimental farm as their guide.

COMMUNITY OF PASTURE.

Farmers usually have to keep part of their holdings in pasture lands if they wish to combine stock raising with farming. This is not so on the Wheatland tract. The entire body of land is fenced and each settler's



HOMES AT SMALL COST IN WYOMING.

land is fenced. The unsold land forms a common pasture which is open to stock belonging to the settlers. As sales of the land cut down the area of this pasture, grazing lands adjoining the colony will be used as pasture for stock on which an inexpensive system of close herding will be employed, or in the event of the cession of lands to the states, it will be rented and fenced by the community and used as common pasturage for the stock of the settlers. By a combination of farming and stock raising both occupations may be made a source of sure and continuous profit, and in no place in the West is the opportunity to do this equal to that at Wheatland.

AID FROM LAND OWNERS.

The Wyoming Development Company, while possessing ample capital, does not engage in any enterprises to make money out of purchasers of its lands, but on the contrary, encourages settlers themselves to engage in these enterprises. There is a big demand for brick and the company could make a profit by engaging in its manufacture. Instead of doing this the clay banks have been leased to a settler who, in addition to farming his 80-acre tract of land, is burning a kiln of 200,000 brick for all of which he has contracts to sell. The company has also decided not to open any stores, or hotels, but will leave all these fields open to individuals. In repairing ditches, building new canals, enlarging reservoirs, cultivating its farms and all other work which it is having done the Development Company offers work to settlers who may have time to spare from their own work, and no outside labor is employed if it can be obtained from the community. All supplies used by the company or its employes will be purchased from those engaged in business in the community.

CHARACTER OF SETTLERS.

The fact that the settlers who have become the pioneers in the colony are familiar with irrigation methods and are practical irrigators will be of great aid to all subsequent settlers. The experience of the pioneers and the invariably satisfactory results of their farming will be infallible guides for all future purchasers.

THE TOWN OF WHEATLAND.

A townsite has been laid off by the company at Wheatland station on the line of the C. & N. railway, and the building of a substantial town commenced. The location for a pretty town is unsurpassed. The land slopes gently toward the railroad on the east. On every side can be seen the green fields of grain and alfalfa. The horizon to the west is the wooded summits of Laramie Peak and Squaw mountain and to the north and east the ragged hills through which flow the Laramie and Platte rivers and Chugwater creek.

Two general stores have been built. They are owned by men who have bought farms in the tract. One carries a \$10,000 stock of goods, the other \$15,000. Several frame residences have been erected. Contracts have been let for the erection of a brick school house, a brick hotel and several brick residences. A daily train north and south puts the town in close communication with Cheyenne, the capital of the state, and Douglas and Casper the principal towns in Converse and Natrona counties. The town is in close touch with the outside world. It seems an incredible statement, but it is a fact that the Chicago Sunday papers are received at Wheatland at noon Monday.

Freight rates to Wheatland are but slightly in excess of those to Cheyenne, and lumber, coal and general merchandise will be sold as cheap there as along the main line of the Union Pacific. Native lumber is close at hand, the entire line of mountains and foot hills west of the town being covered with a heavy growth of pine.

CLIMATE.

It is well known that the entire Rocky mountain region both on the east and west slope is possessed of a health-giving, invigorating climate. At Wheatland the winters are short and mild. Very little snow falls and the country before settlement was one of the best winter ranges for stock in Wyoming. The altitude ensures freedom from fevers and the variety of the atmosphere and its dryness affords in many cases a certain cure for lung and throat troubles. The summers are cool and pleasant.

GAME AND FISH.

Hunting and fishing are close at hand to the Wheatland settler, and if he has time and inclination both are to be enjoyed. Deer, elk, bear, antelope and



ALFALFA PILED FOR STACKING.

ADVERTISING SUPPLEMENT.

smaller game are found in the mountains directly west of the lands. Laramie Peak has been noted for years as the finest field for big game in the West. Ducks and geese are plentiful in the fall and spring in the many small lakes and ponds in the neighborhood of the tract and along the Laramie river and its various tributary creeks. The storage reservoirs on the company land are stocked with food fishes and the Laramie and Platte rivers swarm with pike and channel cat while in the mountains are numerous trout streams.

PRICES AND TERMS.

The lands are sold at \$12 to \$25 an acre, according to location and quality. This price includes ownership in the water, every purchaser becoming a joint owner with the other purchasers and with the company in the irrigation system under which the lands lie, thereby doing away with the heavy and onerous burden of an annual water tax, which in most colony and irrigation schemes puts a perpetual burden on the settler and takes away a good share of his annual profits; never gives him absolute ownership in the water, without which his land is worthless, and thus puts him forever at the mercy of the owners of the water system under which he is farming. Buyers of Wheatland farms buy the water rights also, the only annual charges being a pro rata division of the cost of annual repairs and these, owing to the stability and strength with which all the works have been constructed, are nominal.

Terms are easy. A cash payment of one-tenth is required at the time of purchase. No payment except interest is required the second year. The balance is to be paid in nine annual payments. Interest is 6 per cent. A family with \$500 cash can get a

Wheatland farm and by industry and economy can, during the first year, make a living and a fair profit and in the succeeding years can rise gradually, but surely, to financial independence.

AN UNEXCELLED OPPORTUNITY.

By the actual results of six years' farming the lands of the Wyoming Development Company are proven to be of excellent quality.

The water supply is ample to irrigate every acre.

The irrigation works are permanent and substantial and water storage is provided by natural and permanent reservoirs.

Markets are close at hand; prices are good and by reason of Wheatland's location in reference to the range cattle industry and to the iron and other mineral districts will continue so.

Railway communication is established.

Good schools and churches are ensured.

The conveniences of the town are close at hand.

Stock raising may be combined with farming under the favorable circumstances of free pasture.

Prices, considering the quality of land and that they include ownership of water rights, are exceedingly low.

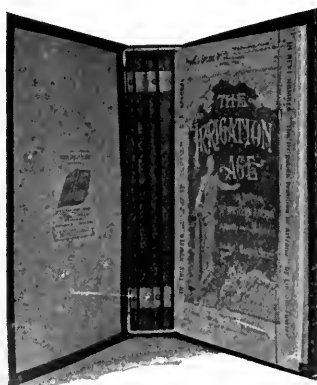
Terms of purchase are easy.

These facts considered, there is no place in the United States offering safer, surer or more substantial inducements to the intelligent farmer and home-seeker of small capital than are to be found at Wheatland.

For any other information the intending settler or home-seeker should address,

J. A. JOHNSTON,

Cheyenne, Wyo.



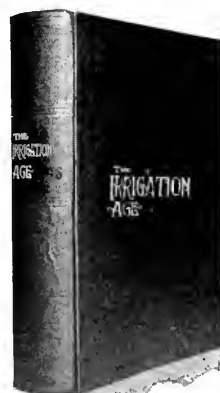
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THE IRRIGATION AGE.

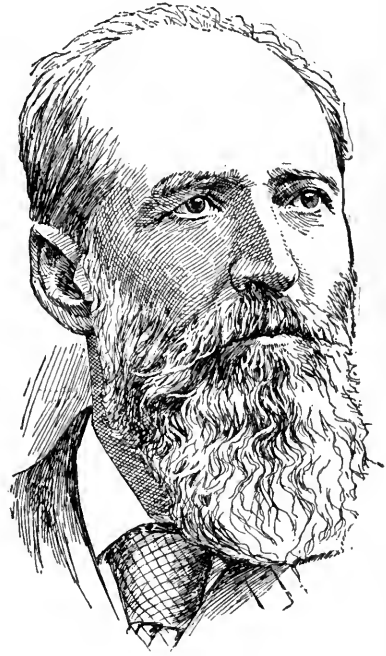
VOL. VII.

CHICAGO, AUGUST, 1894.

No. 2.

THE PROGRESS OF WESTERN AMERICA.

Arid America and Our Institutions. The friends of Western America are watching current events with the keenest interest. A peculiar combination of circumstances, covering a period of at least fifteen months, has been at work shaping the future of our civilization along new lines. Almost every one of these events, however startling they may have been to conservative sentiment elsewhere, has brought to the thoughtful leaders of the irrigation world new and convincing assurances of the early triumph of their ideas and the speedy realization of their hopes. The future belongs to Arid America. It is in her broad valleys that industry shall be reorganized upon surer foundations than it has known before. It is in the western half of this continent, and only there, that outlets can be found for surplus population, that gainful work can be found for idle hands, that new institutions can be established without dangerous interference with existing rights. The Republic is sorely pressed and troubled, but its last and greatest resource remains to be utilized. In Western America there is room for sixty millions more people, who can sustain themselves without encroaching upon any acre now occupied, or upon any property right now vested in individual or corporation. To prepare this new domain for occupancy will absorb labor now idle and employ capital now timid and apprehensive. The conditions which have brought about the present situation are numerous, and no single remedy will solve our difficulties. But the greatest single remedy will be found in the provision of land for the landless, homes for the homeless, labor for the laborless and independence for the dependent. This is a solution which the men of the arid West can tender to their fellow countrymen, and which no other men on earth can offer. We need no longer ask ourselves whether the American people *will* avail themselves of this opportunity. The time has come when the American people *must* avail themselves of it. Above the clamor of protest and the murmur of indifference rings the imperious voice of Fate. It is the destiny of Arid America to save



HON. LIONEL A. SHELDON,

Chairman of Committee of Resolutions at Los Angeles.

our institutions with "a new birth of freedom," and to prove again that "this government of the people, for the people and by the people shall not perish from the earth."

Liberty will Survive the Shock. What may be the condition of the country when these words reach the reader cannot be foretold, but they are written amid the tumult of warring classes and at a moment when there is some reason to apprehend that old institutions are crumbling beneath our feet. Certain it is that the tide of events flows swiftly—that it is turbulent and angry. Certain it is that mighty forces are at work and that we are on the

threshold of stupendous changes. These may come peacefully or they may come through those awful forms which have wrought out stupendous changes in the past. But it is certain that they are coming. Whatever may be lost or gained, whatever modified or strengthened in the process, we may be sure that human liberty will not perish. If, as the immediate result of the present strike, human liberty should seem to lose, we may be sure that in the end it will be the gainer as the result of the trying times through which we are passing. If there shall be temporary loss or disappointment for the mass of mankind, it will be because our laws are wrong, and because the American people uphold their laws, good or bad. But it is the many-headed people who make the laws, and the remedy for existing conditions rests with them. The vast majority of the people have decided to draw the line on certain tendencies which have marked legislative, judicial and administrative conduct in this country during the past twenty years. Western interests must surely be benefited. For many years we have been talking the claims of Arid America to dull ears. We may expect a more attentive audience hereafter. This is preëminently the hour to bring forward new ideals. But let us suppose that the nation should say to the men of the West to-morrow, "We are ready to join hands with you in an effort to reclaim and populate the arid domain. What is your plan?" What then would be our answer? We have none. There are many plans, but none on which we have substantially united. If every duty of patriotism rested upon any part of the American people, it rests at this moment upon the leaders of popular opinion in the West. And that duty is to come together, discuss the whole situation, harmonize their differences, and map out a national policy that shall be in line with the new tendencies of our time. Failing in that duty at this moment of supreme opportunity, God only knows when we can regain what we shall lose by our criminal negligence. There are moments in the history of peoples when a single definite act will shape the current of events for centuries. THE IRRIGATION AGE believes this is the moment when we must say what character of organic law shall serve as the broad foundation of the civilization of Western America.

Why the Irrigation Congress is Vital. It is in this light that the Third National Irrigation Congress, which will assemble at Denver, September 3d, is seen to be an event of extraordinary importance to western men. Elsewhere in this number of THE AGE large space is devoted to the plans of the congress. The article should be carefully read by all friends of irrigation, and each individual should make up his mind to do his part in rendering the event successful in the

highest degree. There is ample reason for the prediction that the Denver convention will surpass in interest and importance all previous bodies of this kind. The time has come when certain things must be settled. If we have irrigation conventions hereafter they will deal with different phases of the subject than those now up for consideration, unless the Denver meeting fails entirely in its purpose. It will be the business of this congress to formulate measures; we sincerely hope it will be the business of the next to celebrate their triumph. The plans made for the Denver meeting are radically different from any convention we ever heard of before. It is proposed to adjourn the convention on certain days in order that the delegates and spectators may go out and study the physical aspects of the questions with which they are dealing. It will be as if the Congress of the United States should adjourn a tariff debate to go to New England and study the practical manufacture of cotton cloth, or to go abroad to compare wages and the conditions of working people with things existing on this side of the sea. But while this feature is unique, and while everything that is an innovation is to a degree hazardous, we believe the plan will prove immensely attractive and profitable. One thing is certain, and that is that Colorado will do everything in her power to repay delegates and visitors for their attendance upon the convention.

It is well to recall at this time the main features of the declaration of the International Irrigation Congress held at Los Angeles, last autumn. That was another convention which discarded precedents and proceeded to get results by original methods. Instead of passing a series of resolutions it adopted a ringing "Address to the People of the United States." It recognized the differences existing between men equally sincere as to national and State legislation and it created the commissions so that those differences might be studied with a view to final compromises. At the same time, the "Address to the People of the United States" was not a colorless document. It boldly laid down certain fundamental principles which, in the judgment of that convention, must forever underlie our irrigation philosophy. It was the desire and expectation of that convention that whatever policy might be hereafter favored would rest upon those principles. The commissions were instructed to steer by that chart and there is little reason to fear that any representative convention of western men will depart from this ground. We call attention at this time to the most important features of the memorable "Address to the People of the United States" because it seems highly important that the public recollection should be refreshed on this subject just upon the eve

of the reports of the several Irrigation Commissions and the assembling of the Third National Irrigation Congress.

The Public Domain a Heritage. The Los Angeles address began by inviting the attention of the country to the fact that the public domain fit for agriculture without irrigation is exhausted. It then stated that a sufficient portion of the arid public lands can be irrigated to furnish homes for millions of families. "Notwithstanding the present condition of these arid lands," said the Address, "we confidently predict that they will become the seat of the highest civilization and the greatest average prosperity yet developed on this continent. The intensive scientific cultivation rendered possible by irrigation results in the largest conceivable development of independence and prosperity on the fewest possible number of acres." It was then declared that "the problem of conquering these deserts is national in its essence. These lands are the heritage of the American people. To have a home upon them is the birthright of every American child. The conditions under which they would be reclaimed and acquired by the settler must be founded on the recognition of these facts." It is impossible to lay too much stress upon this feature of the declaration. No policy which proposes to take these lands beyond the control of the American people, or to permit private interest alone to name the terms on which they shall be acquired after reclamation, can permanently endure. We have no land policy to-day worthy of the name. It is purely a game of grab. The Desert Land Law, in a majority of instances, is the cloak of dishonest purposes and methods. It keeps the word of promise to the ear and breaks it to the hope. That is its design. The great principle enunciated at Los Angeles must prevail, but it can be preserved by any one of a number of plans suggested. Remembering the fundamental idea, we must proceed to select a plan of legislation upon which we can all agree and which will appeal powerfully to the nation's sense of right. Another important declaration under this head favored the limitation of the amount of land to be taken by individual settlers to forty acres. This was a radical step, but it won wide public approval.

Division of the Streams. The Los Angeles Address made this explicit declaration concerning the thorny subject of interstate waters: "We declare that all streams rising in one state and flowing by natural courses through one or more other states must be conserved and equitably divided under federal authority." In another place it is declared: "Nothing must be allowed to jeopardize interstate streams, and it is highly important that the drainage

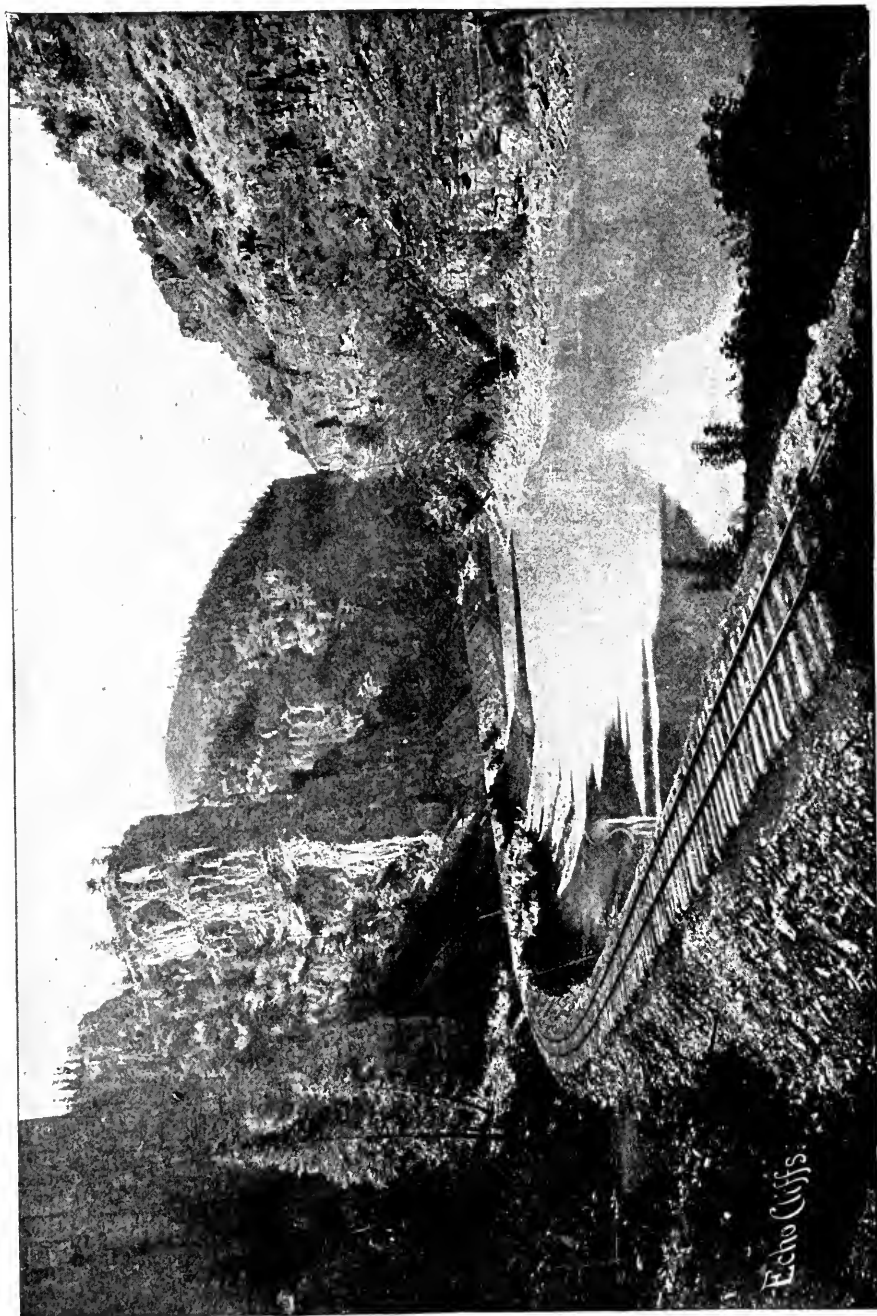


J. F. ROCHO,

Of Greeley, Member of Executive Committee for Colorado.

areas of these streams should be promptly known and defined at once in a way sufficient for the purpose here in view and not await the slow results of a thorough technical inquiry, which should follow in its train and for its needed purposes." It was further suggested that a non-partisan national commission should be appointed to investigate the whole subject of national legislation. It has, of course, been impossible to secure that during the past year. Doubtless interstate waters will furnish an absorbing topic at Denver. The question is surrounded by many difficulties, but it must be solved sometime and somehow. There is nothing to be gained by dodging it. The men who will assemble at Denver are a hundred times better fitted to deal with the question than any Congress we shall ever have in Washington. It is the part of wisdom to look this subject squarely in the face and recommend to the country the very best plan that western brains and patriotism can devise.

The Ownership of Water. The only point at which the Address was vigorously attacked in the convention was where it dealt with the abstract question of water ownership. Representatives of certain private interests thought the paragraph on this subject might well be left out, although they did not seriously dispute its soundness. The paragraph was modified in some respects, but in its final shape read as follows: "We declare it to be the correct princi-



ECHO CLIFFS—A UTAH SCENE.

Echo Cliffs.

ple that water in natural channels and beds is public property; and when, under the law of any State, vested rights have been secured thereto, such rights, like all other private property, may be supervised for beneficial purposes and be condemned for public uses, under the exercise of the power of eminent domain." The Congress favored the leasing of the pastoral lands and the use of the army in preserving the forests. It favored liberal appropriations for scientific work in the semi-arid regions.

Honest Debate on the District Law. It will be remembered that previous to the last congress THE AGE made a strenuous effort to induce both the friends and opponents of the District law of California to be present at Los Angeles and discuss that measure to a final result. Hon. C. C. Wright, author of the law, was present and delivered a very notable speech, in which the law was thoroughly analyzed and explained from the standpoint of its friends. Not a single critic of the law arose to discuss it. And yet there is much criticism of the statute in California. Within a few miles of the opera house in which the convention met prominent citizens were at that moment engaged in an effort to disorganize a district, which would seem to be the best possible type of a locality to which such a law is adapted. We refer to the Anaheim district, which, according to the latest accounts, is now a complete failure. In many other portions of the State the law encounters vigorous criticism. The declaration of the Los Angeles congress on this subject is as follows: "We endorse the principle of the district irrigation law of California, commonly known as the Wright law, as a wise step in the direction of the public ownership of irrigation works. While we do not assert that it is suited to the needs of unsettled localities, or that it cannot be improved in some of its minor details, we do declare that experience has demonstrated its usefulness, its fairness and its economy." We believe this declaration, properly construed, correctly represents the attitude of the friends of irrigation. They approve the principle. They do not believe law is suited to unsettled localities. They do not deny that it can be improved in some of its minor details. Now, many other States are seriously considering the adoption of a law like that inaugurated in California under the leadership of Mr. Wright. It is not only desirable, but it is absolutely necessary, that the subject should be discussed from every standpoint at Denver. Mr. Wright will be there to defend it and to answer all criticisms. But if the discussion is to be profitable to the representatives of States outside of California, it is essential that some able critic of the law should stand up with a list of the districts, the amount of bonds voted, the amount of work done and all other details, and point

out what weaknesses have developed in the system. One of the ablest students of irrigation law is L. M. Holt of Los Angeles, who has been closely associated with Mr. Wright in the championship of the District system. Mr. Holt says there are vital points at which the law must be strengthened in order to be thoroughly successful. The Denver congress should be enlightened on this side of the question. The intrinsic strength of the proposition of public ownership, together with the ability of Mr. Wright, may be trusted to secure another triumphant vindication for the principle involved in the District law. But if other States are to have the full benefit of California's experience, every side of that experience should be fairly and fully exhibited at Denver.

Gov. Sheldon Should be Sent to Denver. The Committee on Resolutions of the last Irrigation Congress was very fortunate in its chairman. This important position was occupied by Hon. Lionel A. Sheldon, of Pasadena, California, a gentleman who has enjoyed a wide and distinguished experience in public life. For six years he represented New Orleans in the popular branch of Congress, serving under Speaker Blaine on the Committee of Ways and Means and having the lamented Garfield for a colleague. He was governor of New Mexico at the time of the Lincoln county war and won the highest credit for courageous and vigorous conduct on that occasion. As chairman of the Committee on Resolutions at Los Angeles Governor Sheldon kept the Congress on the best parliamentary basis and gave to the committee itself the greatest dignity. He is a man of broad views, deeply impressed with the part which irrigation will play in the future life of the Republic, and determined that our legislation shall be in accord with conditions essential to the highest state of civilization. If Governor Markham sees fit to name Mr. Sheldon as one of his delegates at large the choice will be applauded by all the friends of the movement, and the distinguished gentleman will certainly be as conspicuous at Denver as he was at Los Angeles.

Intelligent Plans for Colonization. The colonization problems of the arid region demand more intelligent study than they have yet received. The colonist is as essential to the success of an irrigation project as water or land. Much stress has been laid upon the need of educating the public to understand the value of irrigation securities. It seems very plain to us that time, money and effort could be more wisely devoted to educating the public to understand the advantages of homes on irrigated lands. When it is possible to guarantee the speedy settlement of land with industrious and thrifty families it will be much easier to sell irrigation securities. No enter-



SCENES IN UTAH ON THE LINE OF THE RIO GRANDE WESTERN R.Y.

prise can earn profits for the investor unless people are found to purchase the lands and utilize the water supply. Nearly every failure we have had thus far has been due to the fact that lands have not been settled after tens of thousands of dollars have been expended in the construction of works. There are many reasons why they have not been settled. In the first place, the public has not yet been made to understand the advantages and charms of life in a region of small farms intensively cultivated by the best irrigation methods. If we can ever get this idea thoroughly well known to the American people every acre of irrigated land will be in speedy demand. Then irrigation enterprises will pay. And as a natural consequence irrigation securities will be in lively demand. There are companies that have spent money very liberally to secure settlers, but there are few companies or individuals who have attempted to do anything worthy of their opportunities in illustrating the possibilities of irrigation farming and its attractions both from an industrial and social standpoint.

**Union for
the common
good.**

If there is any line of business in which the common man can wisely coöperate for their common good it is in this matter of exploiting the opportunities for home-building in Arid America. It is the height of folly for the San Joaquin valley of California to cast reflections on the Pecos valley of New Mexico, or for the Yakima valley of Washington to belittle the advantages of the Salt River valley of Arizona. The fundamental facts in all localities are the same. The irrigation industry is the basis of their industrial life. No man will settle in either place until he understands the enormous advantage of insuring his crops by the purchase of a water right, of living on a farm of 20 or 40 acres and thus enjoying the blessings of neighborhood association, and until he realizes the full force of that industrial philosophy which teaches men to win independence for their families by producing from their own land the things they consume. The men who are placing irrigated lands on the markets, whether they are operating in Kansas, Arizona, California or Washington, ought to stand shoulder to shoulder in presenting the claims of Arid America. Before we can realize any large measure of success we must secure the absolute solidarity of irrigation interests in this respect. No single company, nor even any single State, can alone bear the expense of the campaign of education necessary in order to turn a stream of colonization, broad and deep like a mighty river, into our new western empire. It is a surprising fact that the real captains of the irrigation industry are scarcely known to each other. It has long been the desire of the editor of THE IRRIGATION AGE to bring these men together upon some common ground. They ought to get acquainted, devise some compre-

hensive scheme for promoting colonization, and then set out together on a campaign of conquest. There can be no clash of interests. The reservoir of people in our own country and in Europe which may be drawn upon for settlers is so vast that there is ample room for all.

**An Effort
to be Made
at Denver.**

In the May number of this journal the writer presented an article entitled, "The Republic of Irrigation." The design of that article was to set forth an outline of the possibilities of colony-making on irrigated lands. It was stated that the writer would invite the most influential and thoughtful men of the various States and Territories to meet him at the next irrigation congress with a view to perfecting plans looking to the development of a high type of colonies in various portions of the West. It is still the writer's purpose to make this effort. The nature of the undertaking is such as to make it impracticable to publish details at this time, but we wish here and now to extend a hearty invitation to those interested in the settlement of irrigated lands to meet the writer at Denver during the sessions of the congress between September 3d and 10th. The duties of the congress will, of course, be very pressing and will occupy the time very fully, but the night is long and time can be found for the thorough discussion of this matter before the delegates depart for their homes. It is high time that the problem of making homes where the common people may realize the highest average prosperity were approached intelligently and courageously. The task is great, but the world has never lacked men capable of performing great tasks when such men were demanded by the relentless pressure of events. There is clearly a call for enlightened effort. We promised in the Los Angeles platform "to evolve new forms of civilization, to give new life to popular institutions." The promise must be kept. It must be kept because the best interests of our beloved West, of our common country and of humanity alike demand it. It is not necessary that it be undertaken in a spirit of pure benevolence. Men require a reasonable incentive to induce them to work hard in any cause. It is no reflection upon our pilgrim fathers to remark that when they founded a colony where they might enjoy religious liberty they created a demand for corner lots in the town of Plymouth.

**A Signifi-
cant Scandi-
navian
Movement.**

The work of colonization has been proceeding quietly but to some effect during the past year. Important results have been achieved in portions of California, in northern Utah, in Idaho and elsewhere. Quite the most significant thing that has transpired in this direction is the movement of Scandinavians into the Snake River valley of Idaho. Since the middle of March one company has disposed of 10,000 acres of land, in lots of

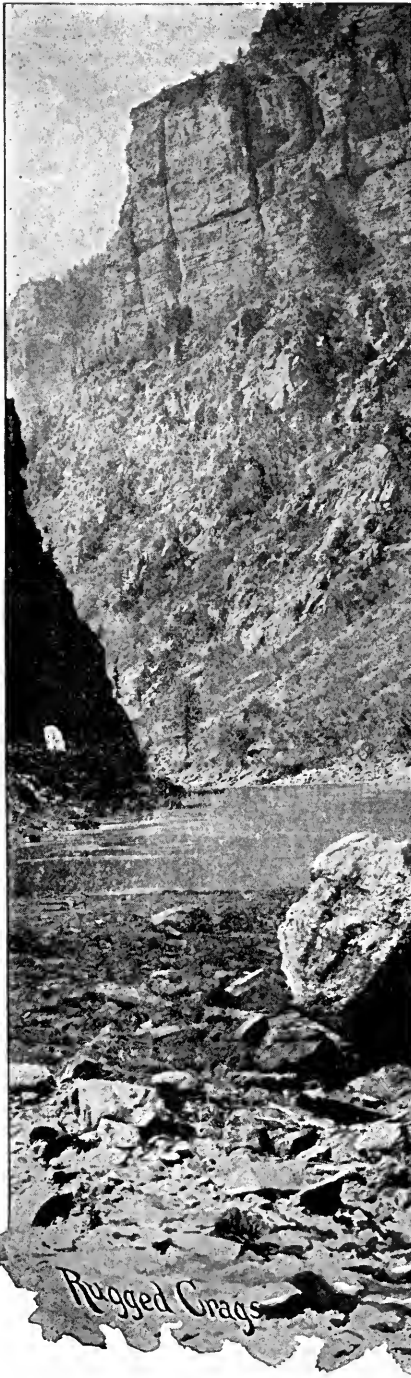
less than 80 acres, to families who will become actual settlers at an early date. The work is being directed by men who were largely responsible for the location of Scandinavians in Minnesota, the Dakotas and other parts of the old Northwest during the past twenty years. These leading men say they have discovered that irrigated land is the land of the future. They are actually moving considerable bodies of farmers from the best portions of Minnesota to the new State of Idaho. Their convincing argument is the fact that crop failure is impossible under a good system of irrigation, and that one acre in Idaho will produce more wheat, year in and year out, than four acres in the best part of Minnesota. The shrewd Scandinavian instantly concludes that the place for his children is in the irrigation empire, and that the time to purchase is before the pressure of settlement becomes greater. Here is more evidence to convince us that it is only necessary for the people to learn the truth in order to find settlers in abundance for our irrigated lands. The logic of irrigation is unanswerable, but it is necessary to have it properly stated to ears that will listen.

Mr. J. F. Rocho has proven to be one of *Mr. Rocho's Good Work in Colorado* the hard-working members of the National Executive Committee. Heavy responsibilities rest upon him in view of the fact that the coming congress was located in his State, a fact for which he is himself largely responsible. The work of organizing public sentiment, of assisting in perfecting plans for the congress and of directing the labors of the Colorado Commission, have furnished very ample employment for Mr. Rocho this summer, and compelled him to make many sacrifices for the cause. We are pleased to say that the gentleman seems to be quite equal to the tasks imposed upon him. It is understood that Mr. Rocho's friends are urging him as an exceedingly available candidate for Auditor of State at the hands of the Populist convention in September. The friends of irrigation throughout the West would be pleased to see this high honor conferred upon him. What they have seen of his capacity and fidelity to duty leads them to believe that he would reflect credit upon his party and State.

The Producers of Wheat and Corn. Two great staples of the earth are wheat and corn. In 1893 the vast area of 34,629,418 acres was employed in the production of wheat and the vast area of 72,036,131 acres in the production of corn. According to the Department of Agriculture the men who cultivated these areas received for their corn a gross return of \$8.21 per acre and for their wheat \$6.16 per acre. What did it cost them to raise an acre of wheat and an acre of corn? The Department of Agriculture lately presented a summary derived from the individual estimates of over 25,000 wheat growers and 28,000 corn growers in various parts of the country

giving the average cost of production. Four thousand experts were also called in and gave the results of their observations and calculations; the net result of all of which was to fix the cost of producing wheat in the United States at \$11.69 per acre, and that of corn at \$11.71 per acre. If we allow that the feed and manual value of cornstalks may be worth say \$3.50 per acre above cost of handling, we shall find that the corn crop of last year just paid expenses, including land rental, which the Department put at \$3.03 per acre. But allowing the same value to wheat straw per acre as to cornstalks, we find that the net cost of the wheat crop of 1893 was \$8.19 per acre, and its net value at the farm \$6.16 per acre. That is to say, the farmers of the United States produced last year 34,629,418 acres of wheat at a loss \$63,397,000. While this estimate of the Department included a charge for land rental, it is obvious that even though most wheat growers may own the land upon which their crops are produced, in estimating the gain or loss of the year a rental for land, equivalent to interest upon its present value, should be charged. It must be confessed that these figures present a startling condition which calls for prompt and decisive remedies. It is entirely clear that such a state of things cannot long prevail without bringing irretrievable disaster upon our farming interests. It is true that the present low prices of wheat emphasize the situation somewhat, and it has not been previously so entirely unsatisfactory. Nevertheless, the farmers are now standing face to face with a problem that demands an early solution.

Is there any remedy which farmers themselves can apply? One California contributor, W. C. Fitzsimmons, makes the following suggestion: "Now let us suppose that our farmers cease to struggle with Indian ryots and Egyptian fellaheen in the European wheat markets and decline to raise wheat for export. Let the wheat areas be cut down one-half—to seventeen million acres or thereabouts—which could easily be accomplished, each farmer decreasing his acreage at least fifty per cent. A little extra care and labor bestowed upon this reduced acreage could, and should, bring up the average yield to say 18 bushels per acre, which would make a crop of 300,000,000 bushels, or enough for our home supply without any surplus for export. The moment we cease to export wheat, the price of foreign wheat in the European markets is bound to rise, since the available surplus in the world would, for a time at least, be greatly curtailed. Not only, therefore, would our farmers reap the benefit of such inevitable rise in values, but, assuming the McKinley tariff of 25 cents a bushel on foreign wheat to stand, that amount would be also added to the value of every bushel of wheat produced in the United States. Assuming that a rise in price of only ten



Rugged Crags

was found to be the case at the close of 1893. In short, whatever the price, fixed as it now is, we should have the benefit of the 25-cent tariff and of any rise that might come in the European market. But this is not all. By devoting the seventeen million acres of land thus relieved from wheat-bearing to other and more profitable uses, such as pasturage or mixed cultivation, it is reasonable to assume that a net income of \$5 per acre could be obtained. This would add \$85,000,000 more to the right side of the farm ledger, beside relieving this large body of land from the continual and exhaustive drain of wheat production. In conclusion it may be said that this condition of things can be brought about in a single year by the farmers themselves, and without any invocation of supernatural or superhuman agencies. It is a condition easily reached, and requires for its attainment only the plainest common sense, hearty coöperation and honest tenacity of purpose."

*All Hail the
State of
Utah!*

Amid the gloom of the memorable month of July, 1894, one bright star shone out suddenly and resplendent. It was the star of the new State of Utah! The bill providing for its admission finally passed the House July 12th, and the President affixed his signature a few days later. And so the greatest of all the Territories becomes a full-fledged American commonwealth. The event is extremely gratifying to western men, because it means more votes in both branches of Congress for those policies which western men believe necessary to the realization of national destiny. The meanest critic of western institutions has never denied that Utah has the population, wealth and potentialities of growth essential to Statehood. The admission has been opposed only on the ground that the preponderance of Mormon voters would render the State practically subservient to the church. There are those, not only in the East but in Utah herself, who harbor this fear in all sincerity to-day. The writer does not. Doubtless Mormons will fill the greater share of the offices, and wield the larger degree of influence, precisely as would be done by Methodists or Baptists if they held the numerical strength in Utah that the Mormons hold. But that the majority of Mormons will regard citizenship as merely a new power to be placed at the disposal of their church, we emphatically refuse to believe. Such might have been the case if Statehood had been conferred fifteen or twenty years ago. At that time the whole Mormon body stood upon the defensive, seeking to protect a "peculiar institution" against what they sincerely believed to be unwarrantable persecution.

But that "peculiar institution" has passed away. A new generation has grown up. Their interests are similar to those of the people of Colorado on the east and California on the west. These interests will cause

cents per bushel in the European market should be the result of our retiring from the present ruinous competition, and adding to this the 25 cents tariff now operative, we have 88.8 cents per bushel as the value of our wheat instead of 53.8 cents as

them to divide between the great political parties. Their supreme interest is the progress and prosperity of Utah—that land which they love as Germans love the Fatherland. Utah will be an American State, and, in time, one of the foremost of

American States. One bar to her progress fell when the practice of polygamy was discontinued and the church party dissolved. The other bar falls with the shattering of Territorial bonds. The future of the beautiful State between the Rockies and the Sierras looks as bright as one of her own morning skies.

**A Great
Railroad
Proposed.**

It is widely announced through the press despatches that the admission of Utah to Statehood will be quickly followed by active operations in the construction of a railroad system from Salt Lake City to the coast. It is stated that prominent officials of the Mormon church are coöperating with Isaac Trumbo of San Francisco and Gen. J. S. Clarkson of Utah in this undertaking. Surveys have been made and assurances of ample financial backing secured, according to current report. It is said that the railroad will open up enormous coal beds in southern Utah and then proceed southwest to a connection with the Santa Fé system. We sincerely hope this report is well founded. Such a railroad is much needed and will give a splendid impulse to the development of a section of country which is very richly endowed by nature. It would create an avenue for the exchange of commodities between localities which differ widely in character and products. Southern California will ship largely to the inter-mountain region in the North, and the latter section will ship largely to Southern California.

In the near future ocean traffic will come into San Diego's phenomenal harbor. The new railroad will also open a splendid field for irrigation enterprise all along its line. It seems almost too good to be true that such a line can be built in the midst of the prevailing hard times, but if the potent influences of the Mormon church are behind it we believe it can be done. The resources of these people are large and their credit of the highest. They have never yet failed in any industrial undertaking.

**Opening
Utah
Indian
Lands.**

The United States Senate has passed the bill opening to settlement 3,000,000 acres of Indian reservations in central Utah. This will give another glorious impulse to the new State. The lands which it is proposed to open are among the best in Western America. They are endowed with rich and varied natural resources, and the country will become a wonder field for prospectors, as well as for the development of agricultural and horticultural industries. It is understood that the numerous beautiful valleys are amply watered. There can be no doubt that money and men will rush in to make the most of the opportunities from which they have so long been barred by the presence of the Indians. All things considered, Utah would appear to be at this moment about the most promising State in the Union. It will be difficult for her to escape a genuine boom. It is pleasing to reflect that her foundations are perfectly solid, and that she ought to be able to amply reward whatever amount of labor or capital shall be expended upon her.

The Third Real Estate Congress will be "**Back to the Land!**" held at St. Paul, Minn., August 21, 22 and 23. The secretary of this body is Mr. O. W. Crawford, of Chicago. This gentleman is doing a good work in raising the slogan, "Back to the Land!" His articles on this subject have been widely published. In these articles he notes the steady decrease in the average size of farms, and predicts that they are destined to grow smaller and smaller in order to accommodate the pressure of population. The Real Estate Congress will take up this subject in earnest. Mr. Crawford believes that small farms are going to be popular, not only in the irrigated region, but in the Middle, West and South. He believes the people must go back to the land in order to sustain themselves and make the nation prosperous. The friends of the arid region are glad to observe this kind of agitation. They think they know to what section the people will go when they are thoroughly aroused to the necessity of colonizing vacant lands.



THE THIRD NATIONAL IRRIGATION CONGRESS.

COLORADO PREPARES A ROYAL WELCOME FOR HER SEPTEMBER GUESTS.

BY THE CHAIRMAN OF THE NATIONAL COMMITTEE.

THE Third National Irrigation Congress has been called to meet in the city of Denver, September 3d. It is certain to be the most interesting and important convention of its kind ever held in this country. It will mark the culmination of years of effort in organizing public sentiment in favor of comprehensive plans for the reclamation and settlement of the arid lands.

The people of Denver and of Colorado are doing everything in their power to attract a large and representative attendance, and they will go further in their effort to make the event profitable in results, and pleasing to those who participate in it, than any community has attempted to go before. The rivalry for the honor of entertaining the convention was sharp and earnest. Denver was chosen because of its favorable location, railroad facilities and hotel accommodations, but the people of Colorado as a whole see in the event an extraordinary opportunity which may be turned to their advantage in a legitimate way. They can well afford to spend money and time to make the most of it as a means of putting their advantages before homeseekers and investors.

The importance of the Congress to the people of the United States, the character of its deliberations, and the nature and extent of the excursions proposed are sketched in the following article.

I.—ARID AMERICA FACES ITS OPPORTUNITY.

Every citizen of the arid States and Territories should feel a deep and active interest in the coming Congress. Irrigation is not a distinct industry by itself in the West, but the foundation of the entire industrial fabric in half a continent. The reclamation of land and the settlement of population thereon is equally important to the railroad, the merchant, the manufacturer and the professional man. In a very large sense the future of all the West is bound up in the future of irrigation. A Congress which proposes to declare the deliberate and studied conclusions of the western public concerning the national policy of the future may properly claim the widest public attention for a few days at least.

THE OPPORTUNE MOMENT FOR THE WEST.

There are other important reasons why the Third National Irrigation Congress should be the object of

liveliest interest to all western men. It will assemble at what is likely to prove the most opportune moment in the history of the country for effective work in the interest of irrigation progress. We are in the midst of an extraordinary period of depression. We have recently beheld the strange spectacle of thousands of idle men marching upon the national capital to demand some sort of relief. In politics and in industry there is accumulating evidence of popular, discontent and unrest. There is now no citizen of the United States, however conservative he may be by nature, who does not recognize the need of some new impulse in our industrial life and the need of a new outlet for idle energies and surplus population. We have had periods of depression before, but a vast unoccupied public domain has always served as a safety valve. To-day, when the pressure seems more severe than ever before and when our institutions seem fairly brought to the test, as foretold in Macaulay's remarkable prediction, there is no outlet unless the arid lands are to be speedily reclaimed by some form of enterprise, either public or private. Last year irrigation may have been a western fad; to-day it is a great national necessity. Last year it was the price of western prosperity; to-day it is perhaps the price of peace and safety for national institutions.

WE MUST MAKE HOMES FOR MILLIONS.

The most conservative authority on record concedes that the deserts of Western America, under a proper system of irrigation, will sustain as many more people as now live in the United States. To render this possible will, in the first place, furnish employment for vast capital and great numbers of men. In the second place, there will have been created homes for millions of families. Under a system of diversified farming these millions of families can sustain themselves, if they can do no more. Is there anything more important in this hour of darkness and strife and evil foreboding than the making of an irrigation policy under which these great ends can be achieved?

EVERY INFLUENCE SHOULD UNITE.

It is in this aspect that the coming congress should attract the attention and command the support of all western men, for it is in this aspect that it will obtain and hold the respectful consideration of the country at large. We shall look in vain for any en-

lightened legislation by the Federal Congress until we suggest it ourselves and until we support the proposition with practical unanimity. This is the opportunity for us to solve the problem and to organize the forces which will carry it successfully before the country. It is the opportunity which should be taken at its flood, lest our future "be bound in shallows and in miseries." Every man and newspaper of influence in the West should labor unselfishly and energetically from now until the Congress assembles at Denver to make the event successful in the largest and best sense.

FORMER IRRIGATION CONVENTIONS.

To fully comprehend the importance of the Denver Congress it is necessary to know something of its predecessors. The first Irrigation Congress was called by Governor Thomas and met

THE POLICY OF LAND CESSION.

The principal argument in favor of cession was that this measure was the best that could be obtained. Very few people regarded it as the ideal solution of the arid land problem, but the vast preponderance of opinion at the first congress was to the effect that the East would never consent to large appropriations, and that the West must itself deal with the question as one of local importance. Senator Warren of Wyoming introduced a bill based upon the Salt Lake platform. The measure failed to command the strong support which its friends expected in the West itself. An opposition, based upon the fear that the lands would be frittered away by corrupt legislatures, speedily developed. In the East the measure was strong, as its friends had anticipated. Eastern public



F. C. GOUDY.



G. O. SHAFER.



F. D. CARPER.



E. W. MERRITT.

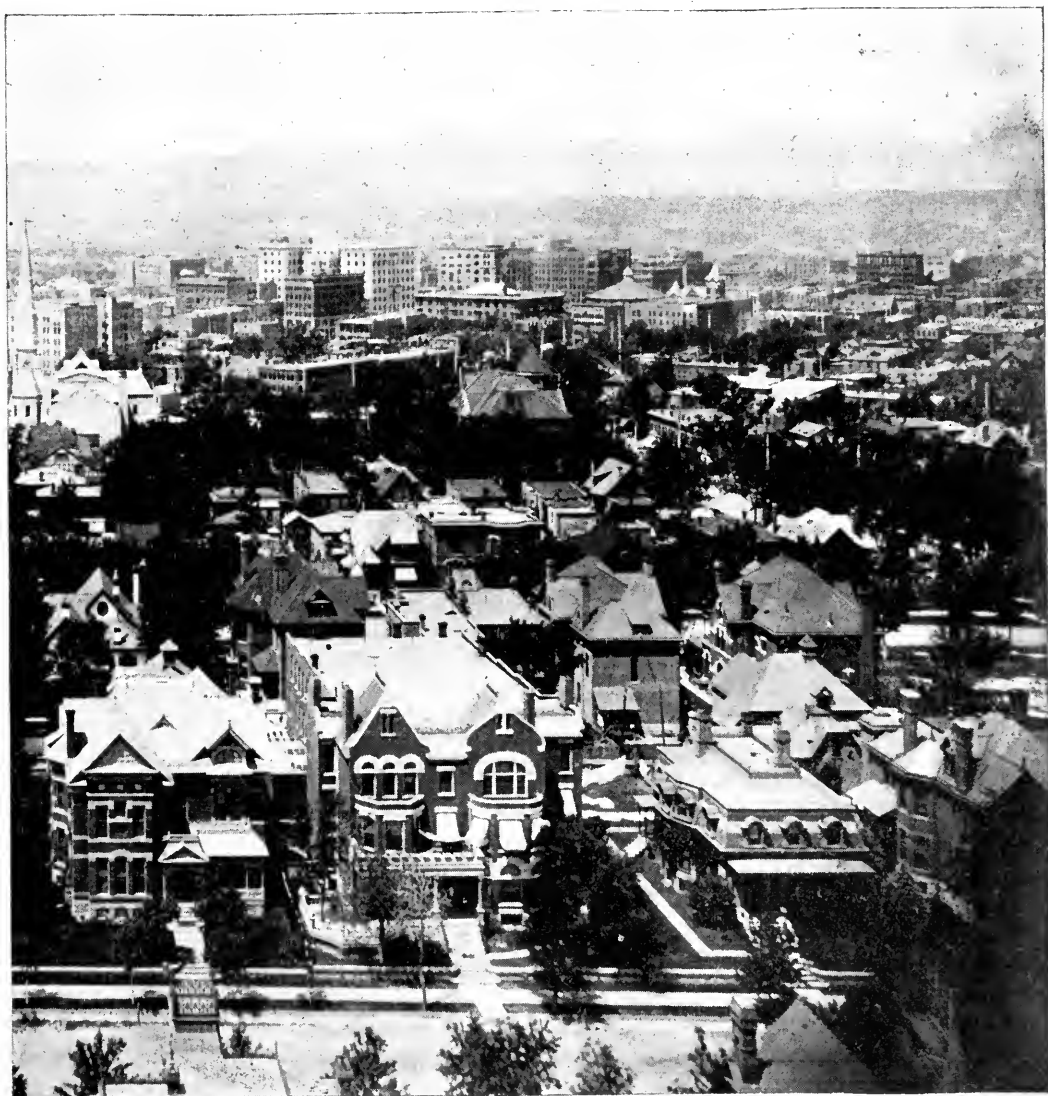


M. C. JACKSON.

MEMBERS OF DENVER COMMITTEE.

in Salt Lake City, Utah, in September, 1891. It was largely attended and many eminent men were included among its delegates. The object of the convention, as stated in the call, was to consider the cession of the lands to the States. Only this aspect of the subject was considered and after several days of animated debate the Congress, by a practically unanimous vote, declared in favor of cession.

men and newspapers were willing to say to the West, "Take your worthless arid lands and get out." It is believed that the present administration feels this way about it and would willingly lend its influence to a plan of cession if now vigorously presented by the West. But upon that proposition alone the West cannot be united, and it is hoped that a better plan can be devised.



THE CITY OF DENVER.

THE SECOND CONGRESS AT LOS ANGELES.

The second Irrigation Congress was held at Los Angeles last October and resulted in the creation of the irrigation commissions. This was avowedly a truce between the friends and the opponents of the plan of cession. It provided a year for study and debate, at the end of which it was hoped a wise compromise could be effected and western sentiment united upon it. The congress at Los Angeles accomplished more than the creation of the commissions, however. It attempted to declare certain fundamental principles upon which measures of legislation should hereafter be based. In another depart-

ment of this number of *THE IRRIGATION AGE* these principles are stated and analyzed.

OTHER FEATURES OF THE PROGRAMME.

Each of the former irrigation congresses presented elaborate programmes aside from the debates and declarations upon the vital issues referred to. Such events always attract a large attendance of thinking men, and bring to the front those most capable of discussing the various phases of the subject in which they are particularly interested. This was the case at Salt Lake, but in a larger degree it was true of Los Angeles. In the latter case the more extended

and important debates occurred in the Committee on Resolutions. The congress itself was occupied for five days with the presentation of papers and addresses covering a wide range of topics. The delegations from foreign countries contributed largely to this feature of the programme. There was scarcely a dull moment from Tuesday forenoon, when the congress was called to order, until late Saturday night, when it reached final adjournment. Many applications have been received for places on the Denver programme, and while the plans have not yet been completed in all details, it is quite certain that the programme of the coming congress will be fully as entertaining and instructive as that at Los Angeles. But in many respects the Denver congress will differ radically from any which has ever been held.

II.—THE IRRIGATION COMMISSIONS AND THEIR WORK.

As has already been said, the congress at Denver will mark the culmination of years of discussion and agitation. The feature of transcendent interest at Denver was foreshadowed in the following paragraph of the Address to the People of the United States, adopted by the Congress at Los Angeles:

The result of the investigations of these several commissions shall be submitted to the next Irrigation Congress, at a time to be designated by the Executive Committee, not exceeding one year hence, and upon these reports the final and definite declaration of the people of the western States and Territories may be based. By this means we hope, within a reasonable time, to suggest a satisfactory irrigation policy to the nation and to the States and Territories, and we hereby declare our purpose to erect it upon broad foundations of justice and equality, and with due regard for the rights of both labor and capital.

This portion of the address was telegraphed to the country and reproduced in hundreds of newspapers. It was deeply impressed on the mind of every delegate, and by every means in the power of the convention the public was notified last October that the next Irrigation Congress would aim to express "the final and definite declaration of the people of the western States and Territories." This was the means adopted to harmonize conflicting views and unite the western public upon a national irrigation policy. It is thus quite certain that the reports of the several Irrigation Commissions, the debates to which they will give rise, and the final conclusions based upon them, must constitute the overshadowing features of the coming congress.

CHARACTER OF THE COMMISSIONS.

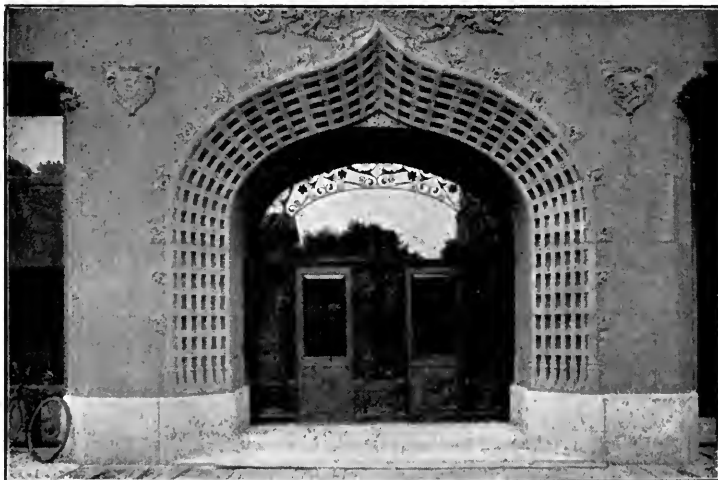
The commissions appointed in accordance with the Los Angeles platform are generally composed of the best material. Most of them have been faithful to the responsibilities imposed upon them. It is yet too early to furnish any forecast of their conclusions and recommendations, but they have collected a vast amount of valuable material and the Denver Congress will certainly be able to deal more intelligently with its problems than any other convention has done.

NEVADA FIRST TO ORGANIZE.

Nevada named the first commission. Gen. John E. Jones, of Carson City, the energetic member of the National Committee, stands at its head, and his associates are L. H. Taylor, of Reno, W. C. Pitt, of Lovelock, James Newlands, Jr., and R. M. Clark, of Carson City. This commission held its first meeting November 13th, and appointed auxiliary committees reaching out into all portions of the State. It has flooded Nevada with circulars and letters and there is reason to expect that its report will be one of the most exhaustive, as well as one of the most inspiring and suggestive submitted to the Congress.

THE CALIFORNIA COMMISSION.

California named a very notable commission, headed by Hon. Eli H. Murray, the former governor of Utah, and including such well-known names as Hon. C. C. Wright, author of the District law; W. S. Green, now surveyor general of the State; L. M. Holt, one of the foremost irrigation thinkers in the country, and J. A. Pirtle, of Los Angeles. This commission had its first meeting in December and divided the State into districts in order to provide



BROADWAY ENTRANCE TO BROWN PALACE HOTEL.

means for a thorough canvass of public opinion, as well as to secure data for an intelligible report.

AN ABLE COMMISSION IN KANSAS.

Judge J. W. Gregory, of Garden City, stands at the head of the Kansas commission. He belongs to the first rank of irrigation leaders and Kansas is certain to maintain her usual prominent position as the result of the work of the commission named by him. It is as follows: Judge V. H. Grinstead, of Dighton, L. Baldwin, of Great Bend, A. B. Montgomery, of Goodland, F. D. Curn, of Topeka. H. V. Hinckley was added to the commission as consulting engineer. The Kansas commission has held several meetings at the State capital and distributed circulars calling for information to many citizens of the State.

OTHER NOTABLE COMMISSIONS.

Another very notable commission is at work in Wyoming. State Engineer Elwood Mead is at the head of it and President Johnson of the State University is a conspicuous member. Several meetings have been held and a comprehensive circular mailed to every voter in the State.

The work of the Idaho commission has also attracted much attention. It is composed as follows: T. D. Babbitt, Nampa, chairman; Charles H. Irwin, Nampa; F. J. Mills, Pocatello; J. E. Ostrander, Moscow; A. D. Morrison, Idaho Falls.

Colorado has a notable commission which includes Prof. L. J. Carpenter, of the State Agricultural College, J. Sire Greene, the former State Engineer, Ex-Mayor Platt Rogers, of Denver, and W. S. Carpenter, of Cortez. J. F. Rocho, member of the National Committee, is *ex-officio* chairman of the commission and is devoting his time liberally to the work.

The New Mexico commission is headed by Mortimer A. Downing, of Santa Fe, who enjoyed a rich experience as Col. Hinton's right-hand man in the Bureau of Irrigation Inquiry at Washington. His colleagues are C. B. Eddy, of Eddy, Frank S. Coolidge, of Olio, O. H. Hadley, of Watrous, and W. H. Hopewell, of Hillsborough. This is a commission which ought to give a good account of itself.

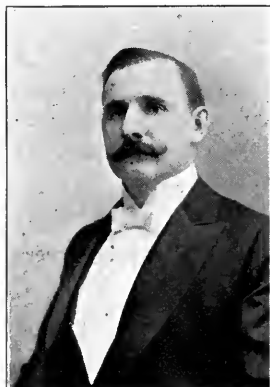
S. B. Robbins, of Great Falls, heads the Montana commission, which includes Col. A. C. Botkin, of Helena, author of the memorial to Congress issued by the Salt Lake convention. The other members are Paris Gibson, of Great Falls, W. H. Sutherlin, of White Sulphur Springs, and W. A. Clark, of Butte.

The Nebraska commission is as follows: Charles H. Ross, North Platte, chairman; J. M. Lee, Oxford; John R. King, Benkelman; B. E. Brewster, Harrison; George E. French, North Platte.

The South Dakota commission is as follows: J. T. McWilliams, Aberdeen, chairman; S. W. Narregang, Aberdeen; S. H. Riggs, Frankfort; A. B. Hassett, Redfield; Robert Evans, Spearfish.

Three commissions of which much is hoped are those of Washington, Utah and Arizona. The chairman of the Washington commission is Dr. N. G. Blalock, of Walla Walla, who represented his State at the World's

Fair so successfully as executive commissioner and who is thoroughly identified with the industrial life in the arid portion of the far northwestern State. William H. Rowe, chairman of the Utah commission, is president of the Bear River enterprise and also of the company which is doing such important work in central Utah on the Sevier river. He will bring to the next congress a thorough knowledge both of the early and modern irrigation methods in the Territory which he represents. Judge



H. J. MAYHAM.



FRED. E. COE.



CALDWELL YEAMAN.



JOHN C. TWOMBLY.

MEMBERS OF DENVER COMMITTEE.

J. L. VanDerwerker, of Yuma, is chairman of the Arizona commission and is also very much in earnest and thoroughly well equipped. His commission will deal with the problems of our new Southwest and its report ought to be an important contribution to irrigation literature.

The Georgia commission, as noted in this journal last month, consists of five very prominent citizens of the Empire State of the South, and its report will be awaited with much interest because the idea of irrigation in that part of the country is itself unique.

A CODE OF STATE LAWS.

The reports of the irrigation commissions will deal not only with the question of a national policy, but also with local laws which it is hoped may be made common to all the States. This latter feature is one of great importance. It is certain to lead to a full discussion of the District law of California, of the office of State Engineer and other subjects of the widest interest. It seems desirable that it should be the policy of States to do more for themselves and expect less of the National Government. It is hoped that the influence of the congress will go far to popularize this idea.

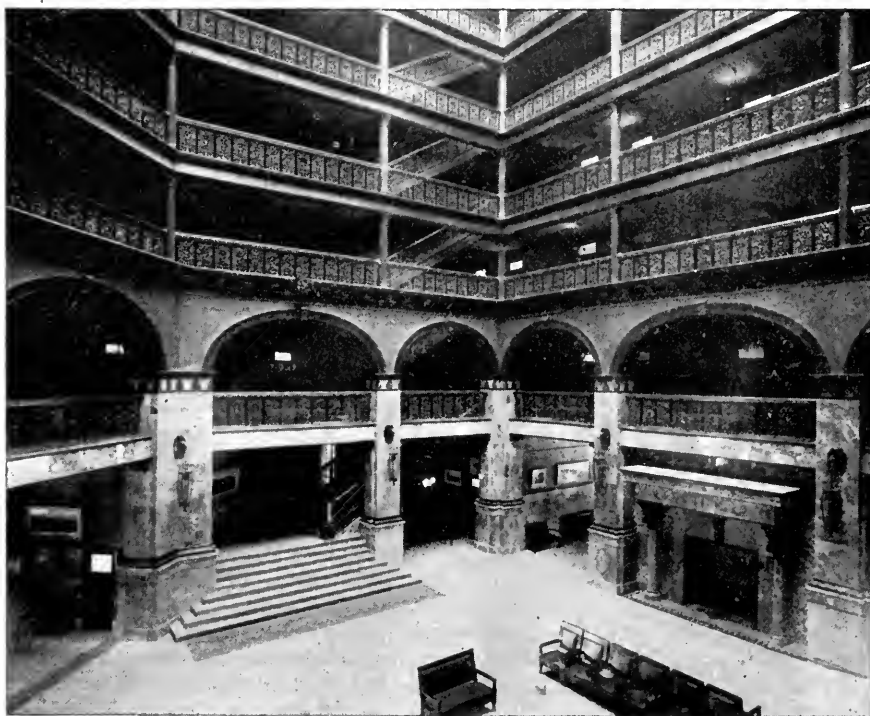
ENLARGING THE SCOPE OF THE NATIONAL WORK.

An effort will also be made to enlarge the scope of the National Executive Committee. This is absolutely necessary in order to put irrigation before the country as a national issue and secure the triumph of the policy enunciated by the coming congress. It will also have a beneficial influence in providing outlets for irrigation securities and securing settlers for irrigated lands. If the committee could next year be extended so as to include a representative man from every State in the Union the result could not fail to do good. But nothing in this direction can be done until the West is ready to present its plans to the country with an earnest and unanimous voice. We must settle our differences first, and then appeal with united front to the American people.

TWO COMMITTEES ON RESOLUTIONS.

It is likely that the work of the coming congress will be divided between two committees on resolutions, one dealing with national legislation and one with State laws. In view of the vast importance of the subjects they will discuss, it is desired to have the convention itself analyze the reports of the State Commissions and debate every item that may enter into the final declarations of the congress. While the

plan has not been perfected as yet, it is likely that the commissions will submit their reports on the first night of the convention, and that the committees will then deal with them by topics. For instance, the Committee on National Legislation may first take up the forestry subject, then pastoral lands, then interstate waters, and so on to the end of the list. A similar plan might be pursued by the Committee on State Legislation. Having shaped its report upon one topic, the committee can refer it to the congress for debate and ratification or



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rejection. In this way the congress itself will be kept constantly busy with the main issues, the committees having first discussed them and formulated an expression of their views. It generally happens that the committees consist of the foremost men of the congress, and as a rule the convention endorses their conclusions. But it is desired that the Denver Congress shall deal with its work directly, in view of the fact that the policies to be enunciated may perhaps become the foundation of civilization in the West.

ADOPT A CLEAR-CUT BILL.

There is a strong sentiment in favor of having the national policy expressed in the form of a bill, to be presented to the Congress of the United States. This would be preferable to leaving it for any individual to formulate hereafter. If the results of the congress be embodied in a clear-cut measure, the people can support it with a knowledge of just what they are favoring, and political leaders and conventions will have no difficulty in understanding the proposition. The National Committee will then have a definite measure to urge upon the country.

III.—AN ATTRACTIVE PROGRAMME OF EXCURSIONS.

It is the purpose of the people of Colorado to make the Third National Irrigation Congress the occasion for putting the beauties and advantages of their State conspicuously before the eye of the people. Colorado has suffered some setbacks during the past year. She proposes to utilize this opportunity to demonstrate her marvelous resources, the charm of her climate, the grandeur of her mountain scenery, the sufficiency of her water supply and the fertility of her irrigated lands. The Irrigation Congress will be presented with some of the finest object lessons, illustrating both what has been done and what remains to be done, to be found upon the continent. The plan of excursions arranged by the Colorado people should of itself attract an immense attendance, not only of delegates but also of spectators and of homeseekers. It is true Colorado can be seen at any time, but on the occasion of the Irrigation Congress her hospitality will be on dress parade. Not only that, but low rates of railroad fare will be provided and extraordinary efforts put forth to provide for the comfort and pleasure of all visitors, which includes the spectator and the homeseeker as well as the official representatives of irrigation interests.

THE FIRST DAY OF THE CONGRESS.

The congress will go into session on the forenoon of Monday, September 3. The forenoon session will witness the opening addresses and the temporary organization, with the appointment of committees on credentials, order of business and permanent organi-

zation. In the afternoon session the permanent officers will be elected and the committees on National legislation and State laws will be named. Usually this business, with the address of the permanent president, occupies the time of the afternoon session quite fully. Probably the evening session will be devoted to the reports of the several State commissions and an address by the chairman of the National Executive Committee.

GREELEY AND THE NORTH.

Bright and early on the morning of the second day the congress will leave by special train for Greeley, Fort Collins, Longmont, Boulder and other points of great interest in the irrigated districts. Every friend of Arid America will desire to visit the historic colony of Greeley, which is everywhere known as a type of the best agricultural possibilities of Colorado. Founded under the inspiration of Horace Greeley, in the face of the dangers and hardships of the pioneer life a quarter century ago, this community demonstrates the tremendous significance of irrigation in the economic life of Western America. Its methods, its products, its civic institutions and its homes are so many beacon lights showing the way to prosperity in the future. But there are many other attractions in northern Colorado which the delegates and their friends will be shown on this first day's excursion. Among them is the agricultural college and its experimental farms at Fort Collins.

AGAIN IN SESSION AT DENVER.

The convention will return to Denver Tuesday night and re-assemble in convention Wednesday morning. It will enter upon its second day's session with enthusiasm and intelligence quickened and enlightened by the previous day's sight-seeing in the north. Doubtless the committees will by this time be able to report several sections of the proposed national measure, as well as some features of the code of common State laws. If so, the convention will at once enter upon the debate of these topics and begin the construction of those great policies which must underlie the future development of Arid America. Any time that can be spared from the more important work of the convention will be devoted to a miscellaneous programme of papers and addresses, dealing with various phases of irrigation.

MELON DAY AT ROCKY FORD.

Wednesday night the Irrigation Congress special train will again be at the service of the delegates and their friends. It is proposed to make a night run to Rocky Ford and join the citizens of the Arkansas valley Thursday morning in the festivities of Melon Day. This is a famous Colorado festival. People come from all over the State and consume melons without money and without price. They inspect the

irrigation works and the irrigated farms of the valley and celebrate the triumph of water over the desert. It is expected that this Melon Day will be the most memorable in the history of Rocky Ford, for it will be graced by the presence of men and women from all over the Union and will doubtless call forth congratulatory speeches by the national leaders of irrigation thought. The special congress train will return to Denver during the night, and Friday and Saturday will be devoted uninterruptedly to the work of the congress. The committees will, if desired, occupy special cars and carry on their work while en route. It is likely that the formal deliberations of the congress will be brought to a close at Denver Saturday night, although it is proposed to keep the convention together for several days afterward and to hold meetings in other portions of the State.

THE GREATEST EXCURSION OF ALL.

On Sunday the committee have arranged for an excursion around the "Loop" above Georgetown, one of the most famous scenic points in the State. Returning from this short trip, the convention's triumphal excursion is planned to leave Denver on the evening of Sunday, September 9th. It is this excursion which will exhibit to the delegates, homeseekers and spectators the magnificent scenery and boundless industrial possibilities of the great Centennial State. Short stops will be made at Salida, Gunnison and Delta, arriving at Grand Junction Monday evening. On their return they will pass through Glenwood Springs and over Tennessee Pass by the more northern route and then through the famous San Luis valley of southern Colorado, where three-quarters of a million of acres already lie under ditch, awaiting the electric touch of human labor. It would be impossible to describe the beauties of mountain and valley, of hill and plain, which the visitors will behold in the course of this trip. They will take in the great circle of the Denver & Rio Grande railroad, which carries them not only through the eastern foot hills and down the San Luis valley to the New Mexico border, but into southwest Colorado. No more glorious trip could be selected in Arid America, and Europe has nothing worthy to be mentioned in the same day.

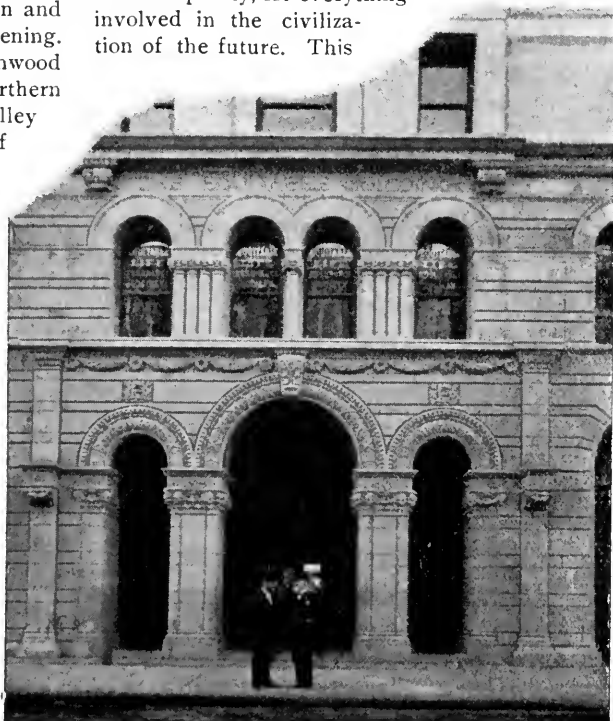
PEACH DAY AT GRAND JUNCTION.

Interest and enthusiasm will begin to reach their highest pitch when the special train arrives at Grand Junction Monday evening, September 10th. The following day, Tuesday, will be the great festival day of Colorado's western slope, when the scenes of Melon Day at Rocky Ford are re-enacted

on a grander scale and peaches are substituted for melons. It will be a revelation to the visitors of the enormous possibilities of fruit farming in western Colorado and eastern Utah. On this occasion the California delegation will be introduced to peaches that are peaches, indeed. Men from all over the arid region, and men from the East and South, will be astounded by what they learn on this occasion of the future of a section hitherto all but unknown to them. Western Colorado will have an opportunity to show what she understands, to be the meaning of that word, "hospitality." It is hoped that not less 500 delegates will be present at Grand Junction on this gala day. They will represent much more than half the States of the Union and several foreign countries.

A MEETING ON THE DESERT.

The country surrounding Grand Junction presents some of the typical problems of Arid America. Here is a vast and voiceless desert. The soil is rich, the climate almost ideal. Through this tract of arid land flows a tumultuous river, carrying an immense amount of now useless water down to the tropic sea. It is proposed to assemble the Irrigation Congress, with its friends and the local visitors to Peach Day, upon this desert and hold there a grand rally for Arid America, for industrial independence, for human equality, for everything involved in the civilization of the future. This



will be indeed a memorable day in the history of American irrigation. This occasion alone should attract an immense gathering from all over the country.

COST OF THE EXCURSIONS.

The Denver Committee of Arrangements, of which Hon. E. W. Merritt is chairman and Thos. L. Smith, secretary, advises us that special arrangements have been made with the railroads in order that these attractive excursions may be placed within the reach of all delegates, visitors and homeseekers.

IV.—DENVER.

The city of the congress; the fascinating, surprising, and not-easy-to-depart-from city, the entire attractions and merits of which we cannot hope to rehearse in one article.

It has become a saying among women that it is unsafe for men to leave the cars, or stop over at Denver, as an irresistible charm is worked to create restlessness and dissatisfaction elsewhere, and when the entrancing city, with its "stony sponsors for the passing years," the grand Rockies, standing as if to guard it for 250 miles, and the long stretches of fine avenues, are all familiar to us, we understand, we feel, and yield to the spell.

We read its history, and try to realize that we are introduced to a city boasting only thirty-five years of existence, but contradictions bewilder us, and we dimly comprehend the marvels accomplished in that short time.

It was of this country that Daniel Webster said, on the floor of the Senate in 1838, when a post-route west from the Missouri was under discussion: "What do we want with this vast, worthless area, 'this region of savages and wild beasts, of deserts, 'shifting sands and whirlwinds of dust, of cactus 'and prairie dogs? To what use could we ever hope

"to put these great deserts, or those endless mountain ranges, impregnable and covered to their very 'base with eternal snow? * * * What use have 'we for such a country?" The answer was begun twenty years later, when savages and beasts were braved, when Denver had its beginning; and since irrigation has transformed these deserts into gardens, and almost innumerable wealth has been wrested from these mountains, we wonder where Webster roams that he hears not the reply.

The claims of this goodly place are not shifting as its sands may have been, but urge themselves upon us as most enduring ones. The almost perfect climate is too well advertised to mention, since Denver has become one of the sanitariums of the world; but no visitor has ever been wholly prepared for the beauty of the city in its splendid public and private buildings; the halls and corridors of the former are faced with exquisite marble or onyx, while scores of homes are of finely cut stone, blue, red or brown. There are hotels of beautiful pressed brick and terra cotta, or of brown stone, cleverly finished in onyx, marble or choice woods, while as a whole, in no community in the country of Denver's size do better school houses stand.

There are no tenement houses to work their harm to health and happiness, but, according to the U. S. census officials, Denver ranks first in the country in the number of homes to her population, for the humblest laborer occupies a separate little home, with no meagre space about him.

Denver is beautifully situated at the meeting point of the plains and the foothills. One hundred and seventy-five miles of boundless prairie surface away from the State line on the east, and only twelve miles westward to the actual mountains themselves.

There is no city in the world that surpasses Denver in its means of public transportation—its rapid transit system astonishes everyone, even its own people, accustomed to its increase and advantages.

As a business and financial center Denver claims as her kingdom the entire country between the Missouri river and the Sierra Nevadas, and from the Gulf to the British Provinces. The business men of the city know that the prosperity of the country tributary to it is necessary for its own best development, and are ever ready to give time and money for any enterprise tending to the building up of the State, or to the improvement of economic conditions in the West. The truth of this is proved by the work Denver men are now doing for the coming congress. Personally, the members of the local committee are but slightly, if at all, interested in agricultural matters, or in irrigation, but to advance the cause of the latter, which they hold next to silver in importance, a



WINDSOR HOTEL, DENVER.

question which, rightly solved, will do more than all else to build up a mighty empire on the plains and foothills of Arid America—for these reasons solely these men spare neither time nor thought in the preliminary work of the congress.

Until recently the position of Denver as a manufacturing center was neglected, but what Western energy can do in a short time is shown in the rows of manufacturing plants now bordering the railroad tracks. The paper mills, making every kind of paper from manilla to fine book and writing paper, supply a dozen States; the cotton mills and the shoe factory, all attest the perfect success of every undertaking in the direction of manufacturing. Mining machinery and builders' hardware are shipped all over the West, to Mexico and South America. Fire brick and fire

clay articles, sewer pipe, pottery, etc., are among the goods of export.

Colorado, as a State, with its fine colleges in the middle section, and its Boulder University in the northern, and Denver, with its generous and high grade educational privileges, leaves little to be done in the intellectual ways.

If what has been said of the convention city shall attract the attention of the readers of *THE IRRIGATION AGE* and decide uncertain ones to go and see for themselves the beauties of the city we praise, and solve the mystery of its subtle fascinations, our purpose is gained, and we shall feel sure of a widespread endorsement of our opinion concerning this city, set indeed upon a hill, whose light is steadily penetrating in all directions.



ESTES PARK, COLORADO, FROM MT. OLYMPUS.—on the Union Pacific System.

THE ART OF IRRIGATION.

SIXTH PAPER: WATER MEASUREMENT AND DELIVERY CONSIDERED.

BY T. S. VAN DYKE.

AT first glance a description of the methods of the most successful irrigating settlements of our country would seem the best way of teaching the use of water. It would be if it did not crowd out more important matter. In these days of haste the patience of the reader and not the "second wind" of the author is the limit of a book. Moreover, a method good in one place may be wholly unfit for another. It may be bad even there, yet good because the best available. Or, it may be good in general, yet bad in some details; as in the illustrations we often see of laterals and sub-laterals, with connections of earth instead of wood, or something by which an even feed of water from one to the other may be insured, so that one stream is not too big and another too small, or stopped entirely by the streams beside it taking too much water, or a leaf, or other small thing, making a dam at the passageway from one to the other; and again, this may be good because the nature of the crop will justify nothing better. A hundred miles from there, or on a different scale, or under a different soil it might pay so well to use the better method that it would be folly to imitate the other plan though it be profitable there. You must learn the principle upon which all good work depends. Then, and only then, can you decide what you want.

CONDITIONS TO BE CONSIDERED.

The best methods will be described as we go on; your choice will depend not upon your preferences or your inclination to imitate successful irrigators at home or abroad, but upon:

- 1st. The character of your soil.
- 2d. Its slope and drainage facilities.
- 3d. The amount of rainfall it has.
- 4th. The amount of water at your disposal for the year or season.
- 5th. The amounts or heads in which this quantity of water may be used by you at different times and the frequency of the times.

Differences in the amount of hot weather, markets and other smaller considerations may also affect this question. But the five limitations above given are absolute, especially the fourth and fifth.

THE DELIVERY OF THE WATER.

And these lead to an examination of the way water is delivered by companies, whether public or private—a subject you must master whether you like

it or not, for the knowledge of it is essential to full success, even if you own your own water works.

As a rule, water from a company is a more reliable and convenient source of supply than any private works you can build. Some of these are companies of which the stock has been sold out along with the land so that the irrigators are in the same situation as if they had clubbed together in the first place and built the works themselves. Other companies sell water while keeping the stock, and these are generally as reliable and good as the others. But the method of distribution is the same in both; it is founded in good sense and will always exist.

BUY A WATER RIGHT.

Water is sold for irrigation by the cubic foot a second or by the miner's inch. In a few cases I have known it sold by the thousand gallons, and one who knows little of the subject is liable to think this a good way. It is, however, too much like buying hay for your horse at so much a straw. So surely as you do it, so surely shall you flatter yourself that that horse is keeping remarkably fat on one or two straws a day less. He will be like the Irishman's horse that he trained to live without eating. Just as he "got him elegantly broke he died." Buy a full water supply and then you will be sure always to use enough. And unless you are in a land owner's company where the stock represents your right to the water, buy what is called a "water right," and don't listen to anyone who tells you that a public water company, like a common carrier, is bound to deliver water to all applicants on tender of the rates. What your trees or other things want is water. They won't thrive worth a cent on damages at the end of a long law suit, especially when the question is one that may be fought over again the next season. A "water right" contract, as it is called, is not, as some tell you, an additional means of squeezing you to enrich eastern goldbugs. It is an insurance policy. You are put on the list of the company's consumers and so much water is set apart for you. No decent company will oversell its supply in such a case, but will save enough water for you in all except extraordinary seasons when you may have to take less, the same as if you were in a landowner's company in which the allowance of water to the stockholders is based upon the average seasons and not upon the exceptional. But if there is no contract

between you and the company it is under no obligation in law or morals to furnish you any specific quantity of water, or any at all, unless you can prove a surplus above what is necessary to fill its contracts with others. And by the time you have proved a surplus the irrigating season may be over and you will have to prove it over again for the next.

WATER MEASUREMENT.

Having secured through stock or contract a perpetual right to a given quantity of water, how is it to be measured out to you?

The standard measure of water is the cubic foot a second, or "second foot," as it is often called. If you had a ditch a foot wide and a foot deep in which the average velocity (not the top or center velocity) was one foot a second it would give you a cubic foot a second. If the velocity were two feet a second it would give you two feet a second, and so on.

On account of the difficulty of getting the average velocity, water in considerable quantities has to be measured with a weir or the fall over a sharp-edged board from a still pond. But this is inconvenient for small quantities and it is not always convenient to make a pond large enough to deaden the velocity of the stream to a stillness reliable for accurate measurement. The miners in early days therefore adopted a pressure measure called the "miners' inch" which now has become a legal measure in some States and Territories. It is generally fixed at a pressure of four inches and is the quantity that will flow through a hole an inch square out of a box in which the level of the water is four inches above the center of the hole.

As this will vary with the nature of the edges of the hole, it becomes a purely theoretical measure deduced from the flow there should be from the laws of gravity. A discount of about 36 per cent. is made for the twisting of the water and other resistance to its discharge, which leaves a flow of 13,000 gallons a day, nine gallons a minute, or 540 gallons an hour. These are in round numbers, which will be used all through for convenience. They vary a trifle not worth considering and only making them harder to remember.

This is a convenient measure because it is one-fiftieth of a cubic foot a second. It amounts to 620,000 cubic feet a year, which equals 4,750,000 gallons. This will cover an acre over 14 feet deep in a year, and cover 10 acres about 18 inches deep. This would give to 10 acres 6 irrigations of 3 inches each, which would be much more effective than 6 rains of 3 inches each, as they generally come. From these data you may figure out other things it will do, but these are enough for all practical purposes.

HOW TO USE THE WATER TO ADVANTAGE.

Suppose, now, you have an inch of water and ten acres of land. You speedily discover that with an inch flowing all the time you can do very little. It keeps you constantly at work and limits you to the use of basins so that you cannot wet the whole ground. By the time you have the last of your tract wet the first part needs water again, and you have no time to cultivate properly. You are doing four times the work you should do and will get less than half the results you should have. If you could let that inch run into a reservoir for four or five weeks or more and then let it all out in a few hours you might wet something with very much less work. In other words, you want not a continuous flow of one inch, but so many 24-hour inches *at once*. The *equivalent* of a continuous flow for a year is what you want, taken in quantities and for lengths of time to suit your convenience. But when you come to figure on a reservoir that will be tight, safe and not a nasty mud-hole most of the year, you are staggered at its cost. Anything like an artificial tank is very expensive, and natural basins of any size with narrow mouths, suitable for safe and cheap dams, do not grow in every canyon. Your neighbors find the same trouble.

NO NECESSITY FOR A RESERVOIR.

Well, why should you build a reservoir when the ditch itself is one? Suppose there are 10,000 inches of water in the ditch and 500 consumers want 20 inches each for 24 hours. With a little care on the part of the management of the ditch they can all have it. Suppose, farther, that there are 10,000 consumers on the line, each with a 10-acre tract, with a water right of an inch to 10 acres. They can all be furnished 20 inches a piece for 24 hours in 20 days. The expense and annoyance of 10,000 reservoirs are thus saved. Some irrigators will want larger heads of water for shorter times and others smaller heads for longer runs. But they will average up so that every 30 days one can have about what he wants. The only restriction is that he cannot have it just when he wants it. But if he sends in his order early enough to give the ditch-tender or secretary time to arrange his deliveries far enough ahead, he can get his water at very nearly the time he wants it. If disappointed this month, the company will try harder to accommodate him to the minute the next time. But after the first few times the irrigator will have his crops accommodated to the times, so that although not exactly what one would prefer, this taking turns works very well in practice, and is the only way of getting water in sufficient irrigating heads without too much expense.

CONTINUOUS FLOW NOT DESIRABLE.

This, then, is the way in which water is delivered by all companies that understand their business. An inch of water *never* means continual flow unless expressly stated. The consumer don't want it in that way and the company don't want to be bothered measuring it in that way. An inch does not mean one inch for 365 days any more than it means 365 inches in one day. One is almost as great a nuisance as the other. It means the equivalent of it, or 365 24 inches, taken in such quantities and at such times, and for such lengths of time, as may be consistent with the rights of other consumers, to be determined by the rules of distribution laid down by the company for the accommodation of all. I know but one exception to this, the San Diego Flume Company, which, contrary to the intentions of its projectors, limits its consumers to a continuous flow. Human ingenuity could devise nothing better adapted to torment consumers and drive a company into bankruptcy. No one of sense will have anything to do with water delivered in any other way than large heads. Fortunately there is but one such company in the world, so the reader runs little danger. The world can produce only one such set of brains in one era. In some companies the rules provide that the gate shall not be opened for less than 50 inches. Ten inches is the smallest head that will be delivered in Southern California outside of the Flume Company above mentioned. No other company will be bothered with anything less and nearly all of them are land owner's companies, too. An irrigator limited to the continuous flow of a single inch is driven to the use of hose and basins. He can use his water only in the day time so that the device is a good one if a company wants to sell twice as much water as it has. He can avoid this only by an expensive reservoir; for one to do much good on ten acres worked for profit should have about a hundred thousand cubic feet of space.

You can now readily understand how your mode of irrigation is limited by the irrigating head, or the amount

at your disposal at any one time, as well as by the quantity you may have for the year. Suppose you can get one hundred inches, twelve hours run, seven times a year. This will give you 350 24-hour inches, or very nearly your inch for the year. With such a head you can flood your ten acres to bed rock if the texture of the soil or other consideration makes it advisable to flood. Suppose, however, that you can get thirty inches two days run six times a year. Here you see are 360 24-hour inches, or very nearly your whole inch for a year. Or, suppose you can get twenty inches three days run six times a year. You then have the same amount and under almost all systems you can get it in this way. You can in either case, if the nature of your soil permits, use the small furrow system, which for many things is so superior to all others that it is folly to be content with anything else, however effective it may be.

SELECT LAND CONTIGUOUS TO WATER.

But suppose you cannot get it in this way and have to take a small dribbling stream. It by no means follows that you must not irrigate. But you must deduct from the price of the water the cost of a decent reservoir to give it its full value. Or, if you are getting it from a spring of your own, or from a well by windmill or other power, you must figure out the cost of all these things before you invest your money and you may find it will pay you to go somewhere else. But the great American irrigating tenderfoot rarely does anything of the sort. He picks out a fine piece of land, or a fine view, or something else that is fine, and after getting anchored by the investment of so much hard cash, paying often a *wet* price for *dry* land, he looks around to see where the water is to come from. If you are going to cultivate the soil for amusement or care only for a pretty place this may do. But if you intend to work the ground for profit take the advice of one who has probably seen more sorrowing tenderfeet than any other man living and reverse this policy. Hunt up a "fine piece" of water first and then look around for the dirt to put it on.

THE DIVISION OF WATER.

METHODS OF DIVIDING WATER IN CANALS AND DITCHES.

BY L. G. CARPENTER.

IN order to divide the water in a canal according to any assigned proportion, it is frequently possible to arrange the ditch so that there is a partition or board in the ditch, which divides the cross-section of the ditch in the same ratio as it is desired to divide the water. This division is not entirely exact, but it is usually close enough for the immediate purpose of those wishing to divide the water, and is

approximately near enough to prevent dispute. The division of water cannot be made exact under such conditions without a great deal of trouble and more expense than most users are now willing to incur. In order that the division made in this manner shall be exact, it is necessary that the water shall have the same velocity across the whole cross-section of the ditch.

POINT OF GREATEST VELOCITY.

The most casual observation will show that this is far from being the case, even in straight channels. The water flows faster at the center than at the sides, and generally faster at the surface than at the bottom. The point of greatest velocity is usually near the middle of the stream and a little below the surface. This being the case, if a division board is placed so as to be, for instance, one-tenth of the distance across the stream, the amount of water which is separated by it will, as a rule, be less than one-tenth of the amount of water flowing in the ditch. In order to make the division exact, it is necessary to make the current uniform across the whole section, and to prevent all cross-currents and eddies. It is desirable, then, to make the division at a point where the channel is straight and uniform for some distance above the point of division. This portion of the ditch should be uniform in cross-section, and with bottom and sides as even as possible. The more even they are the better will the division be. We have not yet arrived, in this country, to the point where the users are willing to take sufficient pains in arranging the conditions for the division. In Spain, where such means for division have existed for centuries, and date back to the time of the Moors, it is customary to take special pains with the channel for some distance above the point of division, even going so far as to pave the sides and bottom of the ditch for several hundred feet. This gives a much more satisfactory division than where the sides are irregular, and are covered with grass and other growth.

ONE METHOD OF DIVISION.

As before stated, even under these conditions the division is not exact when based on this principle, unless the flow of water can be made uniform across the whole channel. The nearer this can be done, the more fair will the division be. Where there is fall enough to the ditch to allow a drop of some inches to a foot or more, it is possible to take special means for making the flow uniform. Thus, in such cases, a board placed across the channel so as to hold the water back and deaden its flow, making the water pass over from an approximately still pool and making the channels below the division board alike in all respects as to drop and fall, the division may be much more exact. In one of the most satisfactory forms of divisors this method of stilling the water has been used, and the partition boards are brought so that the place of division is on the crest of a board

which holds the water back in this manner. Then below this point, as the water passes away to the different channels, it again drops over another board, so that each channel has practically the same conditions as to discharge.

Except by making some arrangement for making the flow of water uniform, the division will be, to some extent, inexact; but it may be satisfactory. The most perfect method of making the flow uniform would be a screen, using either one or more, as the case might be; but, practically, this is impossible, except in the case of waters which carry little or no sediment, and no floating material to clog up the screen, which almost all the waters we have to deal with in irrigation do.

WHERE PROPORTION IS VARIED.

In some cases of division, where there are a limited number of users on the same ditch, it is desirable to arrange it so that each one may vary the proportion of water which he takes at different times, either because he does not need his share or because he trades water with his neighbors. This may be effected in the case of the ordinary form of divisor by making the division board a movable one so that its distance from the side of the box may be varied and the proportion it takes of the whole stream vary in approximately the same ratio. In some forms of divisors, where the stream is small and the partitions are fixed by placing a strip across the channel at the tops of the boards and a corresponding strip at the bottom, over which the water flows, then a series of narrow boards may be used. These may be placed vertically and will be held in position by the two pieces across the channel. If desired, then one, or any one of the various openings, may be entirely closed or reduced to as small opening as desired. It is convenient to be able to do this, because it is rarely the case when a user wants the amount of water to which he is entitled to flow constantly, and he can handle it to much better advantage if he has a larger quantity for a small portion of the time. This he can do by exchanging water with some of his neighbors.

It is hardly necessary to call attention to the necessity of avoiding placing the division boxes on curves in the ditch, where this principle of dividing is used. In such case the heaviest current is thrown to one side, and in consequence the bulk of the water is thrown to that side. If the division is made on that side, then a larger quantity of water is separated than the distance of the board would indicate, and less if the board is on the inner part of the curve.

FIELD FOR IRRIGATION IN WESTERN NEBRASKA.

BY H. EMERSON.

THOSE who know most about western Nebraska have reluctantly come to the conclusion that some form of irrigation is not only desirable but almost essential to permanent prosperity.

The western counties of the State were not settled with any such expectation. It had taken a generation for the people of eastern Nebraska to overcome the drawbacks incident to first settlement, drought, hot winds, lack of market and money, grasshoppers, poor seed, insufficient cultivation, but with time marvelous progress had been made and settlement steadily pushed westwards, until between the years 1884 and 1887 the whole of the western third of Nebraska and Kansas and the eastern third of Colorado were filled with hopeful settlement.

GOOD AND BAD CROP YEARS.

Eighteen hundred and eighty-four, 1885 and 1886 were good crop years; 1887 a failure; 1888 a good crop year with unusually high price for wheat; in 1889 there were good crops, especially of corn, but the price was very low. In 1890 there was a total crop failure, followed by remarkably good crops and prices in 1891. The year 1892 showed fair crops, but 1893 was a very bad year and 1894 threatens to be as bad.

A few settlements even in eastern Colorado have attained a certain degree of prosperity, owing to the exceptional character of the settlers, but on the whole the struggle against low prices in good years, and no crop in bad years has prevented the general advance that all expected ten years ago.

AVERAGE RAINFALL.

The rainfall of western Nebraska is only one-half of the average on the eastern border of the State, yet there are many countries in the world where agriculture is successful with even less rain than the mean of the western counties. Twelve inches of water to every square inch of surface is sufficient for all purposes in a really arid region like Arizona, but in Nebraska there are ruined crops with an average rainfall of eighteen inches. This is partly owing to the fact of cloud bursts, during which rain may fall to the amount of an inch or more in 24 hours, nearly all of which rapidly runs off, may be preceded or succeeded by long dry spells, or that after a week or two of dry weather a burning hot wind begins to blow which in a single day will wither wheat and corn.

The amount of water really needed for crop purposes is very much less than is generally imagined, much less than the average rainfall of all but the

driest regions, *provided* the water application can be absolutely controlled. Cases are on record in California practice where one inch of water per inch of surface has been sufficient, and yet we have crop failures with rainfalls varying between 12 and 24 inches, of which three-quarters falls during the crop-growing months.

EFFICIENCY OF WATER.

In different parts of the irrigated world there is an astounding difference in the efficiency of water, and, as might be expected, the United States furnishes examples of extreme waste and extreme economy.

Taking the flow of one cubic foot per second without making allowance for differing rainfalls and different lengths of growing season, this supplies in Colorado from 50 to 80 acres; Italy, 70; Utah and France, 80 to 100; India, 150 to 400; Spain, as high as 1,000; California, 80 to 1,600, and by sub-irrigation (pipes) from 1,500 to 9,000.

Near Greeley, Colorado, the farmer who doubted if his spring or brook would suffice for 20 acres extends his cultivation bit by bit until it reaches 80 or 100 acres and he still has some to spare.

Bishop Musser, of Salt Lake, states that when the city was first founded, from a certain source there was only water enough for 900 acres, while the *same amount* now supplies more than 5,000.

Fresno, California, furnishes one of the most striking examples of the effects of irrigation. Fifteen years ago the sandy soil, grassless and treeless for scores of square miles, maintained only a few herds of cattle. There was no sign of cultivation; water could only be obtained by sinking wells 40 to 80 feet, and the rainfall was both irregular and insufficient. The King river, the one available stream, carried sometimes no more than 500 cubic feet per second. For some time, even after the canal to supply this colony had been constructed, so rapidly did the open ditch absorb the intake that it was thought the water would never reach the settlement at all. Week by week the thread of water wound its way along, and at last it entered the fields, the flow steadily strengthening, creeping farther and farther on, feeding an ever widening district, until to-day there are fifteen canals drawing their waters from this river, irrigating 55,000 acres, which form a chain of settlement all around the central Californian colony and extending sixteen miles beyond it. Water can now be struck anywhere across the whole plain at ten feet. Irrigation by flooding is being abandoned, for the once arid region has become thoroughly moistened, and where

until lately the contention for water was keen and ceaseless, one hears now of suits against canals on account of the damage done by too much water. In Fresno drainage has become a vital question. The largest vineyard in the district has not been watered for two years.

THE WESTERN NEBRASKA PROBLEM.

With these examples before us there is no question but that irrigation in western Nebraska should produce in time marvelous results and make agriculture a certain success over a very large territory in which the present settlers are very much discouraged and unwilling to try further experiments, and in which new settlement is very slow.

If there is enough water flowing uselessly through western Nebraska to insure crops, if added to the natural rainfall, if this water can be made available when needed, if the water can be raised to the level of the great plains where homestead succeeds homestead for a hundred miles and more, if the cost is not prohibitory, then there is no reason except lack of enterprise and absence of organization, further to delay work on a grand scale.

Each one of these points will be discussed in turn.

The greatest streams entering Nebraska are, the Platte rivers, the smaller streams, the Niobrara in the northern part of the State, Lodge Pole creek, between the Plattes, and the Frenchman and Republican in the southern part of the State.

In square miles these streams have the following drainage basins:

North Platte, before it enters Nebraska.....	28,300
South Platte, " " "	20,000
Lodge Pole.....	2,700
Frenchman to junction with Republican.....	5,100
Republican, all forks, to junction with Frenchman.....	6,600

The relative sizes of these rivers is even greater than the drainage area indicates, for the two Plattes have their sources in the mountains where the annual rainfall is greater than on the plains, where there is more shade and less evaporation, and where the winter and spring snows accumulate and melt instead of evaporating without moistening the ground. In fully one-half the Frenchman and Republican basins, there is no flowing water whatever, all the rainfall being absorbed in sand creeks or little lakes, without outlet.

In the absence of exact measurements extending over a number of years any estimate of the volume of water carried off by these streams must be the merest guessing, but at least we are certain that enough rain falls annually over the Platte basins to irrigate 50,000 square miles, if none of it were lost in seepage and evaporation, and allowing for these losses

enough water runs to waste down the Plattes, especially flood time, to irrigate the whole of western Nebraska.

RESERVOIRS NEEDED.

Unfortunately the flow of water in rivers, dependent as it is on rainfall, varies like the rainfall, and comes when it is not needed, or in too great quantity to be utilized. Without storage basins and reservoirs the quantity of land to be benefited by irrigation will be restricted to that reached by the minimum flow in the ditches during the crop months. This can be but a small part of the whole, for all the flood water will be lost and all the fall and winter flow.

Happily, on all the western table lands there are natural reservoirs which, with very little expense, can be turned into immense storage basins. A single basin of this kind is already in operation in Prowers county, Colorado, near the Kansas line, and though the enterprise has been financially mismanaged, the reservoir, which covers 2,400 acres, has contained water for two years, and is supposed to be capable of furnishing sufficient water to reclaim 100,000 acres. Comparatively small ditch enterprises and the reservoirs have already made Prowers county more prosperous than any eastern Colorado or western Nebraska and western Kansas county, yet the Arkansas river which feeds these ditches has a drainage basin very much smaller than the North Platte river, especially in the mountain region.

Big rivers have deeper valleys than little rivers. It is much harder to get at them and to tap them with ditches. The mighty Missouri carries enough water to irrigate both Dakotas, but its fall is so slight, scarcely more than the necessary fall for a large ditch, that it is impossible to divert its stream. The little Lodge Pole with its little drainage basin and small volume of water, falls at the rate of twelve feet per mile after it enters Nebraska, but the larger Plattes fall with little more than half that rate; nevertheless with sufficient fall to make it entirely possible to run large ditches from the river bed to the table lands.

A large ditch is imperative. It costs less to construct in proportion to its carrying capacity than a small ditch; it will carry more water with less fall per mile, and this is all important, for the beds of the Platte are low and the table lands high, and it will take many miles of careful travel before Platte water can reach the uplands of Nebraska. Also, the larger and longer the ditch, the more land becomes available for irrigation. As the ditch rises away from the river more and more land lies between them, and for each mile of ditch constructed there is an ever growing area that can be furnished with water. The ditch must also be large, because there is the most water running to waste in flood season, and during these

two or three weeks it should be capable of carrying an immense amount.

With an abundant and constant supply of water in the North Platte, with an at present unmanageable amount of flood water in the South Platte, with the Lodge Pole occasionally supplying its quota, the only remaining practical questions are whether the elevations admit of ditch construction at reasonable cost.

THE PROPOSED PLAN.

The object in view is to irrigate the great expanse of table lands south of the South Platte river, taking in on the way parts of Cheyenne, Deuel and Keith counties between the rivers, Logan, Sedgwick and Phillips counties in Colorado, and Perkins, Chase and Hayes in Nebraska.

The elevation of Holyoke above the Gulf of Mexico is 3,734 feet, that of Sterling on the Platte, 50 miles away, 3,920 feet. Here is a difference of over 150 feet, or sufficient to carry a large ditch 150 miles. The elevation of Grant is 3,400 feet, that of Camp Clark on the North Platte, 100 miles away, is 3,800 feet, a

difference in level ample for a large ditch though it should be 400 miles in length.

The plan on a large scale should be to tap the North Platte as far west as practicable, with a mighty ditch 10 feet deep and 100 feet wide, to rise on to the divide between the two rivers and irrigate all the land under the ditch as far as Ogallala, to cross the Lodge Pole, which should also be tapped for any extra or flood water it might supply, to unite with a large ditch tapping the South Platte near Sterling and feeding into the North Platte ditch above Julesburg, and then crossing the South Platte on an aqueduct to rise to the table lands of Phillips and Perkins counties. Such a ditch would cost millions, but it would also irrigate, in connection with reservoirs, two to three million acres and, in time, double that quantity. In its construction, precincts, counties, the railroads and private capital should unite.

The river water is there, the table lands are fertile and occupied, the reservoirs are made by nature. Man must intervene, divert the rivers, fill up the reservoirs and make one vast garden out of what is now only too often a burnt and arid waste.

PUBLIC LANDS IN IDAHO.

BY E. T. PERKINS, JR.

I WISH to describe briefly and in the most general way the present condition of the public lands of Idaho. Idaho is an almost unknown country with an area, in round numbers, of 54,000,000 acres, or 85,000 square miles. Of this only twelve per cent. has been "taken up," or "located upon," that is, passed out of the possession of the general government; and, of this amount only seven per cent. or 3,500,000 of acres has passed into the hands of private individuals, the remainder being railroad grants and Indian reservations. During the last five years settlers have been taking up land at the rate of about 340,000 acres, or seven-tenths of one per cent. a year, so that were all the land available and no increase in immigration, it would be over 140 years before all the State became private property.

The settlements have all been in the southern and western parts of the State. The crest of the Rocky mountains forms the northeastern boundary, and the spurs of this range, running into the center of the State, preclude agricultural settlements.

There are four sources of information concerning these lands, the "Hayden," the "Wheeler" and the "United States Geological" surveys, which are topographical, and the surveys of the general land office, which are divisional. The "Hayden" and "Wheeler"

surveys were made during the years '78 and '79 and cover an area of about 14,000 square miles in the southeast corner of the State.

The Geological survey has mapped about 10,000 square miles in the west and is still at work. The General Land Office has extended its "lines" over about 19,000 square miles in various localities and still has much to do.

The locations of these surveys have been governed by the features of the land and the needs of the settlers. In the southern part of the State, irrigation is everywhere necessary, and the land office work follows the water courses, while the topographical surveys cover in part the irrigable lands and in part the mountainous water sheds which supply the needed water for irrigation. So that while the topographical maps cover solid blocks of country, the land office work, in the south, is over detached areas and generally in lengthy strips following the water courses. But in the north irrigation is unnecessary, dry farming prevails and the land office surveys cover solid areas.

SETTLEMENTS.

As the settlements have governed the locations of the surveys, we find the conditions of the settlements the same as the conditions of the surveys; that is, in

the southern part of the State the settlements are in detached and lengthy strips, while in the north they are in solid blocks.

In the localities where the settlements are frequent, agriculture is the mainstay, in the south they raise general farm products and in the north wheat. Where the habitations are scattered, mining is the industry, and the raising of hay for the draught animals of the mine, the work of the farmer.

At the present time, broadly speaking, there are no public lands in Idaho that can be taken up as ranches without a considerable expenditure of time, labor and money. The open plains are in the south and there the expenditure is for water rights and the general route of irrigation. In the north, where dry farming is possible, the lands have to be cleared of a heavy growth of timber.

It is true that there may be scattered areas suitable for farming, but there are no large bodies of land which do not need capital for development. In the central and comparatively unknown portions of the State, there are several valleys where hay may be raised and cattle run; but heretofore these localities have been unknown or the settlers have been kept away by the fear of hard winters.

CAPITAL REQUIRED.

But while I say the settlement of these lands requires capital, the amount needed is small and the gains are large. Thousands and thousands of acres of unsettled lands in the State are already "under the ditch" and awaiting settlement, it being estimated that there is still available water for four millions of acres. About \$20 an acre is the average cost of land, water-right, clearing, fencing and getting in the first crop.

DIVERSITY OF PRODUCTS.

The harvests are amazing to those who believe Idaho a cold, sterile mining camp, hay requiring three cuttings a year, potatoes 500 and 600 bushels to the acre, hops, apples, apricots, prunes and other fruits in abundance for shipping, both fresh and dried. In the north, where the farms are nearly all upon bench lands, the streams run in deep, narrow canyons, and great crops of wheat are raised, averaging 40 and 50 bushels to the acre.

TIMBER AND MINERAL LANDS.

Thus far I have been speaking only of the farming lands and known portions of the State. In addition there are the great timber areas and the mining

lands, and a large region that is almost entirely unknown.

From the 46th parallel of latitude to the north along the western border there is an almost impenetrable jungle of timber—down timber, the young growth and the old giants of the forest—so interwoven that where the pioneers of settlement have not cleared away you cannot go. These forests extend to the south until stopped by the lower plains of the Snake river, but not in such dense profusion, though still vastly valuable. Lumbermen are making steady inroads upon this vast body of timber, but as yet it is only as the first gnawings of a mouse upon the outside of a cheese.

The minerals and metals seem to occur wherever explorations have been made, but these explorations are likewise merely superficial. I have accented always the known and unknown portions, for there is a great portion of the area of the State altogether unknown.

AREAS SURVEYED.

Of 85,000 square miles the land office has surveyed 19,000, the Hayden survey 7,000, the Wheeler survey 7,000, and the Geological survey 10,000—a total of 43,000 square miles, leaving unmapped over 40,000 square miles, and of this 40,000 miles 10,000 miles is not only unsurveyed but unexplored.

Upon the head waters of the great rivers—the Clearwater, the Salmon, the Koos-Koos-Kie and the St. Joseph—few have been and few go, for danger and privation threaten and the rewards are uncertain.

Upon the outskirts of this region are the valleys before spoken of as offering a home and range for the cattleman.

It is a most beautiful country—open, grassy valleys 30 to 50 miles in length and one to five miles wide, but 6,000 feet above sea; traversed by clear mountain streams; dotted here and there by crystal lakes and surrounded by great forests, out of which rise precipitous masses of rock, crowned by perpetual snow, to a height of 11,000 and 12,000 feet above the sea.

TO RECAPITULATE.

The plain lands in the south must be irrigated; uplands in the north must be cleared of timber; large and valuable bodies of timber throughout nearly the whole of the State; a promise of metal wealth everywhere; and a large, unsettled area that is wondrously alluring to the hunter and fisherman, the lover of the beautiful and the artist, the metallurgist and the miner.

TALKS WITH PRACTICAL IRRIGATORS.

EGYPTIAN CORN.

BY CHAS. W. GREENE.

THERE are many inquiries in reference to Egyptian corn, and its cultivation is so important that I am inclined to write more at length than has been previously done, as to its cultivation and handling after the crop has been grown.

Its value as a feeding grain has been proven beyond any question during the past year. It is a much softer grain than Indian corn. It is more easily and fully digested by the animals feeding on it, and contains the constituents necessary not only for the development of bone and muscle, but also for fattening the animal in due proportion. It is as heavy as wheat, averaging last year sixty-two pounds to the bushel.

TIME TO PLANT.

As to its cultivation, it may be planted any time from the early spring to the 5th of August, and even later than that it will make a most excellent fodder. It has the advantage of being a sure crop. It sends its roots deep and makes a thick mass of them, and in that respect will be of very great value to the soil, which only needs humus, or vegetable matter, to make it highly productive. At the same time, it is not so troublesome a crop to cultivate as the Indian corn; the stubble is not so strong. The roots, although a thick mass, are easily plowed out and decay quickly. The stalks, if left to dry on the field, are brittle and break easily either under the disc harrow or before the ordinary turning plow; in fact, they give but very little trouble in cultivating.

The ground should be well watered, preferably in ridges, and the better it is worked, the better will be the results and the easier the crop can be cultivated. My method is to plow the ground into ridges three or four feet apart, run the water through the deep furrows, then level the ridges down and with the disc harrow stir the soil perfectly and cut it fine. Then, when it is completely level, plant with the double-row corn planter. A single one will answer, of course, but the best is the double-row planter with the check-row attachment, letting a boy work the handles as fast as he can conveniently, so as to drop four or five seeds in a place, and not more than eighteen or twenty inches apart in the rows. The planters make the rows about three feet eight inches apart, which is convenient for cultivating. The disc harrow, which we use for ridging and cultivating, is perhaps one of

the best cultivators, although any cultivator which can be used for corn will serve the purpose.

WHEN TO CULTIVATE.

The ground, being well watered before it is planted, should germinate the seed and make a growth of at least eight or ten inches before any cultivation is needed. Then throw up a slight ridge, or with the disc set to leave a good center furrow, throw a ridge on either side of the corn, not letting it bury the corn any. Leave it with that cultivation until it is eighteen inches high without further watering. Then, in the furrows which have been made by the cultivation, give the ground a thorough soaking, and as soon as possible afterward go through with the cultivators. Then there is no objection to hilling the plant somewhat. This will be the only cultivation necessary to complete the growth of the crop.

If planted before the 1st of May, it ought to be ready for harvesting in August. Then, if cut before the seed has fully ripened and the leaves have turned while the stalk is yet green, both the grain and the fodder of the first crop may be made available. In the harvest of last year I had the tops cut off and threshed. I am disposed to think it can be done better this year by tying the cut corn in bundles of a size convenient to handle, haul them to the thresher, simply threshing out the heads without letting the stalks go through the machine, then send the stalks immediately to the stack from the thresher.

If the corn has been removed, another thorough watering between the rows will put the ground in excellent shape for cultivation, and that will insure a rapid growth of suckers from the root of the plant, which in this habit resembles the sorghum. It will throw up a mass of new growth, which should mature some grain, but which, at any rate, will make from two to four tons to the acre of as fine forage as was ever fed to an animal—a feed which is relished by them and which they eat greedily and cleanly.

It requires about fifteen pounds of seed to plant an acre. The holes in the seed discs of the ordinary corn planter are all too large for this seed. They can be stopped with Babbit metal and a hole three-eighths of an inch in diameter drilled through them will put them in shape to drop the four or five seeds which are necessary in each place. If planted too thick it will not make so much grain, and the result will not be so satisfactory. If planted too thinly, it will not yield as much as it ought. There is a happy medium in this, as in most other things.

As I prepare the land and cultivate it, the cost will be about as follows:

	Per Acre.
Ridging, preparatory to watering.....	\$ 75
Irrigating	20
Tearing down ridges and leveling, preparatory to planting..	1 00
Planting.....	40
Seed.....	40
Four cultivations.....	80
Three waterings.....	60
Cutting, topping and threshing.....	2 50
Stacking fodder.....	50
Cutting, curing and stacking second crop.....	1 00
Total.....	\$8 15

From our experience, under the conditions and with the treatment given, there ought to be a production of at least 30, possibly 40 bushels per acre, and from the two crops at least four tons of good fodder.

Adding to the above the cost of the water rental, \$1.25, and for rental value of the land—10 per cent. on \$50 an acre, or \$5, it makes \$14.40; for which, allowing the fodder to cost \$2 per ton, it would leave 30 bushels of grain, or 1,800 pounds, costing about 35 cents a hundred, or 25 cents a bushel.

Certainly no cheaper grain can be raised anywhere, either for the feeding of neat cattle or hogs. And, as I have before stated, I have never used anything so completely satisfactory, and my experience is now for almost a year of continuous feeding to a large number of animals. It is greedily eaten by horses, mules, cattle, sheep and hogs, and as a poultry feed I know of no equal.

HOP CULTURE IN COLORADO.

BY HENRY N. BELLOWES.

EVERY land owner and cultivator of the soil in Colorado, as well as other portions of the arid land region where the climate and soil are similar, should know that hops flourish remarkably well under irrigation in Colorado and are a very profitable crop. The climate and soil suit the plant. They grow wild in the creek bottoms adjacent to the foot hills, and in many of the mountain valleys, also in New Mexico, and have been successfully cultivated for five to ten years in Colorado in a few yards in Arapahoe, Jefferson and Larimer counties. It has been demonstrated that an acre containing 1,000 hills in full bearing will produce upward of 2,000 lbs., which at 25c. per lb.—an average of value in Colorado in 1891 to 1893—gives a crop worth \$500. Two thousand lbs. to 3,000 lbs. per acre of 605 hills if 8 x 9 feet apart, to 777 hills if 7 x 8 feet apart is a common crop in Washington. THE IRRIGATION AGE for March cites a crop of 3,000 lbs. per acre on 205 acres in Yuba county, California. As much as 4,000 lbs. per acre have been raised on very fertile land in New York, but 2,000 lbs. was an average crop there when the plant was new to the soil. Now, after forty to sixty years of hop culture, 1,000

lbs. an acre is an average yield, and this pays well. Prices in 1893 were in

Colorado.....	23 to 25c.
New York.....	20 to 23c.
California	18 to 20c.
Washington.....	15 to 18c.

Colorado hops bring the highest price of any grown in the United States. They are rich in flavor and have more lupoline (fermenting quality) than those raised elsewhere. On this account a given quantity will produce more and better beer than a like quantity grown anywhere else. The State brewers recognize their excellence and try to encourage this industry at home by paying prices higher than are current in other States, and readily buy all Colorado produces, which is a very small part of the quantity they consume annually. It will, in all probability, be many years before the home production exceeds the home consumption. After that other good and near-by markets including Chicago, St. Louis and Milwaukee, will be open to the hop-grower of the favored climate of Colorado. It is customary to plant hops 8 and 9 feet apart in New York, giving 605 hills per acre. In Washington, 7 x 8 feet is a common thing, giving 777 hills per acre, but in the dry climate and bountiful sunshine of Colorado, 6 x 7 feet, giving 1,037 hills per acre is ample space. It is customary to put two poles to each hill, a foot apart; when this is done there is an equal distance between the rows of poles.

Poles 22 feet long and 2½ inches in diameter at the butt should be used. Too long or too short poles will lessen the product of the vine; it seems to become discouraged in climbing a pole over 25 feet long, and small and few hops is the result. On the other hand, the vine will bunch on a short pole, and, lacking air and sunshine, immature hops result, and nests for insects are made as well. The foot hills and mountains of Colorado abound in small spruce and other trees suitable for hop poles; thus the grower can cut for himself in the fall and winter. Mountaineers will contract for them at \$50 to \$60 per thousand delivered on cars or near-by points. The roots for the new hop plants, or setts, as they are called, are selected from the best runners that put off from the crown of the old plants, which are pruned early each spring, that the strength of the plant may all go to the vines. Four vines only to the hill—two on each pole—are allowed to grow. The setts are cut into lengths, four to five inches, showing two or more eyes, and put two in a hill. The cost is \$5 to \$8 per acre of 1,037 hills. Twenty-five cents per pound, when selected and cut in proper lengths, is the common price. Thirty to thirty-five setts will plant an acre. Runners as cut from the plants are sold by the bushel (75c. to \$1.25) in New York for shipment to the West, packed with damp straw in barrels.

No hops are produced the first year and no poles are needed. A crop of corn or potatoes may be raised between the hop hills.

Potatoes and hops flourish best together. Either crop will shade the ground and thus help the young plants and give a return for cultivation. The second year the hops will produce enough to pay the expenses of cultivation and sometimes more. One pole to the hill will suffice for the second year unless an unusually strong growth has been obtained the first year. The third year a full crop is produced, and the plant will continue to produce well for ten years, and will produce much longer, but experienced growers prefer to renew every ten or twelve years.

One pole to the hill can be made to answer by stringing the yard. This is done by putting a long and strong pole in the center of every nine and running a strong string from its top to the other eight at a point six feet from the ground and sending four vines from each hill to this point, then two on the string and two on the pole. The strings cost about \$5.00 per acre. This saves an outlay of \$60 to \$100 per acre for poles, if the grower has to buy them, but the labor of stringing exceeds that of setting the second poles. Irrigation enough to keep the ground damp below the surface is all that is needed. Frequent cultivation to keep the ground free from weeds and well aerated is essential.

Harvest comes in the early part of September. Picking costs $\frac{3}{4}$ to 1 cent. per lb. green, or 3 to 4 cents per dried pound. Drying including coal and brimstone (to bleach and add to the keeping quality) and all labor costs about 1 cent per lb. Other expenses 5 cents per lb., making a total of 10 cents baled and ready for market. These figures are based on economical culture by experienced hands. Even less than 10 cents is claimed by New York growers, as an average cost of producing, but beginners should reckon on 10 to 15 cents in Colorado. One man can take care of five acres until harvest with slight assistance in the early part of the season.

The sets should be planted between the middle of March and middle of April, but as late as May 1st will answer.

THE IRRIGATION OF SUGAR BEETS.

BY FRANKLIN H. AUSTIN.

IT has been generally regarded in sugar circles that the sugar beet cannot be successfully grown where irrigation is necessary. Although my youth was passed among the sugar-cane fields of the Hawaiian islands, and I received a thorough training in the manufacture of cane sugar, I cannot say that I have more than a general knowledge of the beet sugar industry. It has frequently occurred to me, however, since becoming interested in irrigation in

Southern California, that there should be no valid reason why the sugar beet cannot be successfully grown under irrigation, if the nature of the plant is carefully studied. My attention was again called to the matter by an article in the May number of *THE IRRIGATION AGE*, which speaks of the low percentage in sucrose obtained from irrigated beets at Lehi, Utah, factory last summer. *THE AGE* says: "The sugar beet, like other plants, requires for its proper growth and maturity a certain amount of moisture. Whether this be supplied by natural processes through the usual rainfall, or whether properly applied by artificial means can scarcely make a radical difference with the plant itself." It is upon this very point that I am compelled to differ with the writer of the foregoing paragraph. The artificial application of moisture does make a radical difference with the plant; that is, as far as its sugar-making qualities are concerned.

All plants that produce crystallizable sugar are of a cellular formation. During the early growth of the plant the cells are filled, principally, with grape-sugar, or glucose, without the slightest trace of sucrose. At some period, probably during the latter part of the plant's growth, the glucose in the cells undergoes a gradual chemical change and sucrose is formed. It is very difficult, almost impossible, in fact, to ascertain exactly when this change begins. It is at first gradual and almost imperceptible, but later on, during the latter period of the plant's growth, the formation of sucrose is very rapid. Any sudden application of moisture to the plant during this period of transition has the tendency, to use a technical term, of inverting the sugar, or to reduce it to glucose again.

The only practical method of applying moisture by irrigation is that of bringing it immediately in contact with the roots of the plant. This sudden application, if it occurs during the early portion of the transition period, is likely to destroy the sucrose altogether, and the process of nature in the formation of sugar must begin all over again. If artificial moisture is applied during the latter portion of the plant's growth when sucrose is forming rapidly, it must necessarily either reduce the sucrose, or at least stay its formation for a time. In fact, to prevent the inversion of sugar, or its return to glucose—its original state—is the greatest difficulty to be surmounted in the manufacture of sugar. All moisture introduced in the process of diffusion must be removed by evaporation and the glucose remaining practically removed before the sugar can be crystallized. It is fair to presume, then; that all superfluous moisture furnished the plant during the formation of the sucrose must be disposed of before the process can go on, and all such delays necessarily reduce the per-

centage of sugar to be obtained from either sugar cane or beets, as the case may be. To discover the chemical process by which nature converts glucose into sucrose has ever been the despair of chemists. In the Hawaiian islands, sugar cane depending upon natural moisture yields a larger percentage of sugar in sections where the rainfall comes regularly in the spring and fall than it does in sections where the rainfall is distributed throughout the year. In irrigated sections sugar cane yields a still larger percentage in sugar, but great care is taken in irrigating. During the first half of its growth the plant is given a very large amount of water and the growth forced as much as possible, and no practical sugar planter would ever think of irrigating his fields during the latter months of their growth, no matter how much the plant appeared to need water. There is probably not one sugar planter in ten that could give the reason for this. If asked, he would very likely reply that it would be expensive to irrigate the field, as the cane had covered the ground, and that the plant would live until harvest time.

Sugar beets in California seldom receive any rain from planting to harvesting, yet they yield a larger percentage in sugar than beets do elsewhere, and are ready to be gathered fully a month earlier than in any other beet-sugar section in the world. The soil of California retains moisture in a most remarkable manner. The young plant draws heavily upon the moisture deposited in the winter and grows very rapidly. During the latter part of its growth the plant practically receives no moisture and the formation of sucrose is not interfered with by summer showers, as it is in almost every other beet-sugar section.

I do not claim any special knowledge of the subject and know very little about beet-sugar culture. I do not even know the methods now employed in irrigating beets, but if I were placed in a position where it became necessary for me to plant, care for and harvest a beet crop by irrigation, my judgment would naturally lead me to pursue a course about as follows:

- (1) I would select land which retained moisture well;
- (2) give it a deep plowing and a very thorough preliminary cultivation;
- (3) I would then flood the land, if possible, letting the water run for 36 or 48 hours, or until the land is well saturated;
- (4) after the surface has dried out to some extent, plant the seed;
- (5) during the first half of the growing season I would give the plant all the water it will stand, forcing the growth as much as possible. I should give it a little less water, however, with each irrigation.
- (6) During the last half of the growing season I would give the plant no water whatever. If the land will not sustain plant life for this length of time without addi-

tional irrigation, I should not regard the soil as suitable for beet culture.

I sincerely hope these off-hand suggestions may not lead beet farmers into error, but I should very much like to have the experiment tried. I firmly believe that under some such system irrigated beets will yield a larger percentage in sucrose than is now obtained from non-irrigated beets. If anyone takes the trouble to experiment upon the lines here suggested I sincerely hope the results will be published in *THE AGE* for the benefit of the irrigation world.

PLANT FOOD.

There are few more unpromising looking substances, from a farmer's point of view, than granite, gneiss and porphyry—hard volcanic rocks, all of them. Nevertheless, says E. M. Skeats, of New Mexico, it is to these we owe two of the most useful soil ingredients, viz.: potash, a valuable plant food, and clay, the great reservoir of plant food and moisture.

One of the chief constituents of the above named rocks is a substance termed feldspar, a compound of silica, alumina and potash. As the rock is acted upon by rain holding carbonic acid in solution, and by frosts, it is slowly disintegrated, the potash is dissolved and the silica and alumina left as a fine powder—kaolin, or pure clay. This pure clay, with iron, lime and magnesia, constitutes the ordinary clay which forms an important part of the soil. Seeing that clay and potash, then, have the same primal source, we might expect to find them together, and as a rule where we find a clay soil we find potash in plenty.

The soil of many portions of the arid regions may be said to be a varying mixture of fine sand and clay—the alumina (index of the clay) varying in the samples analyzed from $3\frac{1}{4}$ per cent. to $7\frac{1}{4}$ per cent., and as a rule the larger percentage of alumina has been accompanied with a larger percentage of potash.

The sandy soils containing the smaller amount of potash are not of wide extent; they are mostly in regions where sand drifts have accumulated and are largely made by blown sand. If we exclude these, then the soils apparently are well off for potash, and except for crops which require large amounts near the surface, this fertilizer need not be added. For crops such as pasture, clover, turnips and perhaps potatoes, an addition of potash in the top soil would, no doubt, increase the yield, and wood ashes, which contain much potash, would serve the purpose as well as anything else.

In no case, however, be the land ever so rich, should wood ashes, or indeed any kind of manure, be wasted. We must remember that for every ton of dry alfalfa, for instance, that is sold off the farm the

soil is impoverished to the extent of forty-four pounds of potash and fifteen pounds of phosphoric acid, and these constituents are not like nitrates, which will increase again, but they are gone forever if they are not put back. It is true many of our soils are rich enough to stand a drain for many years, but it is not good farming and true economy to allow it to be thus impoverished.

One ton of wood ashes will put into the soil as much potash as five to seven tons of dry alfalfa will take out, or say twenty-five tons of green alfalfa. A good plan is to keep all the farm-yard manure in a pit, watering it from time to time so as to keep it moist but not thoroughly wet, and throw into this manure pit all bones and animal and vegetable refuse of any nature, together with wood ashes. The manure resulting will be invaluable for garden truck of any kind and good for fruit trees or crops. In using it for fruit trees it should be put in a ring around the tree, so as not to come within say a foot of the stem. It should be buried in the ground about three or four inches to prevent its being blown away or dried out. In no case should it be put into the hole with the soil when the tree is first planted.

Potash is a substance which is very soluble in water, and is thus easily taken into the plant's system by the rootlets. But it is not like a nitrate in being readily washed out of the soil by rains. In this respect it resembles phosphoric acid. It is held in the soil by the oxide of iron and alumina, which possess considerable affinity for it. Of all plant foods the only one which need be feared for on account of heavy rains is the nitrate.

REDUCING EVAPORATION.

The study of evaporation becomes a very important one in an irrigated country where the loss of water is due to evaporation largely.

Now, the chief causes which favor evaporation are these:

First—Free access of the water to the air.

Second—Dry air.

Third—Heat.

Of these we can greatly modify the first two and somewhat modify the third. The first is better obtained by putting a layer of dry, loose dirt on top of the moist soil, and this is done by cultivation at the proper time. The second is lessened by the planting of trees and the keeping of green stuff on the land. The third will be affected in time by tree planting.

Practically, however, one of our biggest losses of water is due to the quick evaporation set up by running the water into hot earth, and this can and should be much reduced.

The easiest method of irrigation, perhaps, is, by flooding. Its easiness is its only advantage. More

water is lost by evaporation by this method than by any other. But its worst point is this: The water goes but a short way down, moistening only the top soil. This educates these plants to throw their roots out near the surface; the water evaporates quickly, and the rootlets get harmed by the heat of the summer sun on the earth.

We want to induce the plant to send its rootlets down for moisture, and the only way to do this is to give it moisture as low down as we can and keep the rootlets from the surface by constant cultivation.

There are two ways of doing this—sub-irrigation, which is expensive in the first outlay, and irrigation by rills. Plow deep furrows some four feet apart and allow the water to trickle through them until the land is well moistened at a spade's depth between the furrows. Before allowing to dry, hoe back this earth into the furrows and cultivate as soon as the land will admit it. By irrigating in this way evaporation will be reduced, water will be economized, the earth will be moistened to a depth of at least two feet, and one irrigation of this kind will last as long as two or three by flooding.

As for the proper times to apply the water, we have to take into account the needs of the plant and of the soil.

CURING ELECTRICITY BY TREE-PLANTING.

That electricity is some form of motion is moderately well proven. Mechanical motion, heat and electricity are each convertible into the other. In an electric light works, for example, the engine driving the dynamo changes heat to motion, and the dynamo in turn changes this motion to electricity by the simple process of friction.

Rub a piece of dry paper with rubber; it becomes electrified and will adhere to the wall or the table. Rub glass with silk, it becomes electrified. Evaporate water and electricity is produced. In all these cases vibration is set up and electricity results.

Now, during the spring sandstorms we have violent friction of air, of glass (sand, which is practically the same), violent percussion of substances of different nature (the sand is made up of particles of iron, limestone and quartz), and violent evaporation wherever there is moisture; everything combined, in fact, to produce electricity on a huge scale; and the air being very dry at these times the electricity is not easily conveyed to the earth and neutralized.

Now, what is a lightning conductor? It is a rod of metal which conducts electricity easily and quickly from the air to the earth, and it has been shown that it neutralizes or draws off the electricity from as much space as would be represented by a cone, the top of which was the point of the conductor and the base a diameter equal to the height of the conductor.

During one of our dry sandstorms a lightning conductor would have its work cut out for it. Now, we have no lightning conductor, popularly so called, but we have excellent substitutes in the shape of young, succulent trees, bristling with leafy points to attract the electricity, and furnished with good, moist stems to conduct it to the earth.

If there were a forest of these trees no harm would result, as each tree would probably conduct no more electricity than was good for it; but, as it is on most farms here at present, our tallest and best trees naturally selected as conductors have to pass too much electricity on to the earth, and many succumb.

The best and radical cure for this electricity is to put in tree wind breaks—the taller the better, Carolina poplar, Lombardy poplar, or cottonwood, all are serviceable, though there are many objections to the last as it becomes older. The wild cherry is destined to become of great service in this respect. It has the advantage of being valuable for its fine, hard wood.

The first thing a settler should do is to plant trees. Every tree helps to promote the individual farmer and the valley. Trees will not only lessen the wind, get rid of the sand and stop the electricity, but they will put more moisture into the air, promote night dews and bring more frequent rain. The land will be bettered and the crops be heavier.

Ostrich Farming.—Ostrich farming could no doubt be made to yield profitable returns even if carried on far more extensively than at present in the United States. Several flourishing ostrich farms are to be found in California, and it is beyond question that many parts of Arizona, New Mexico and southwestern Texas are well adapted to the business. According to a late South African paper, some 20,000 ostriches are to be found on the farms in the Cape Colony. It is alleged that each bird there nets about \$40 per year, which must be regarded a good profit for almost any animal kept about the farm. In the Cape Colony the birds are plucked about every eight months, and yield nearly a pound of feathers at each plucking. Artificial incubation is practiced in Africa as well as in California, and it is found to be of great advantage in the propagation of the bird. The ostrich is especially adapted to the arid region and requires but little care. It is estimated that 1,200 tons of ostrich feathers have been exported from Cape Colony during the past thirty years, valued at \$50,000,000.

Potato Blight.—The potato plant is subject to the early and the late blight, which can be prevented by the regular application of Bordeaux mixture. Blights of all kinds flourish in warm, damp weather, but for either the Bordeaux mixture is effective. To prepare it mix 5 lbs. of blue vitriol with 5 lbs. of fresh

lime and dissolve it in 50 gals. (1 bbl.) of water. Dissolve the blue vitriol in a clean wooden tub or a brass kettle, slack the lime and dilute it to a thin white-wash, then strain through a coarse sieve into the vitriol solution, mix thoroughly and dilute to 50 gals. To apply, use a sprinkling can, pail and whisk broom. Spray pumps are on the market, costing from \$3 to \$50, which are especially helpful in this work.

Red Cedars make fine windbreaks in many places in the West where pines cannot be successfully raised. A windbreak of evergreen possesses many evident advantages over one of deciduous trees; and it is to be regretted that the small extra difficulty of growing the former so often decides people in favor of the latter.

Botanical Collectors will be interested to know that the division of botany of the United States Department of Agriculture has issued in three volumes a manual of the plants found in Texas. The volumes are fine text books of the Southwestern flowers, and everyone in that section interested in botany should write to the Secretary of Agriculture for copies.

Foreign Crops.—Weather advices from London are that it has been warmer and more conducive to the growth of crops during the past few weeks. This is especially pleasing to English farmers, as up to date the season has been somewhat backward, both barley and wheat being in need of warmth. Oats are also promising. In France the continuance of wet weather is a serious drawback, especially as wheat is now blooming. Rust has appeared in some regions and will probably do a little injury, but up to date no serious damage has been noted. In Germany there is some complaint of excessive rain, rye having suffered materially during its blooming time. Hungary, which has heretofore reported excellent prospects for wheat, now claims only a medium yield. The same is true of Austria. Wet weather in Italy has retarded cultivation and caused an excessive growth of weeds. In Spain nothing more than an average crop of wheat is expected; it possibly may be less than an average. In Holland and Belgium crops have made but little progress because of cool weather, while on the other hand in Roumania conditions are very favorable. In Russia excessive rainfall is causing serious anxiety and wheat has there advanced in price because of unfavorable crop conditions.

For the Onion Crop it will be very beneficial to scatter wood ashes along the row. These are a rich potash fertilizer and will tend to decrease the insect pests. Especially is this true of the onion fly, where if the ashes are moistened with kerosene and placed along the row they will be doubly effective.

Fence Posts.—Posts that are to be placed in a clay soil which is liable to heave by the action of frost will retain their original position longer if they are set in dug holes instead of being driven. Unless all the sharpened portion is placed below the action of the frost, and even then, if at the time of freezing the soil is soaked with water, the action of frost is liable to raise the post upward. However, as soon as frost leaves the soil a few blows on top of the post with a heavy maul will return it to its original depth, which could not be so easily done if the post was square at the bottom, as the earth would fall in the cavity. On most soils sharpened posts are best, and when of durable material like cedar, oak or chestnut, and where the fencing material is wire, a post four inches in diameter will last as long and be just as serviceable as one six or more inches in diameter, and the cost is usually less.

Utah Agricultural Bulletin.—Bulletin No. 29 of the Agricultural College of Utah has just come to hand. It consists of a statement of the results of a large number of experiments in irrigation, designed to show the amount of water to be used in irrigation. The summary of results is as follows:

1. The plats saturated to the depth of $1\frac{1}{2}$ feet gave a better crop of grain than a greater or less amount.

2. For timothy, the plats saturated $2\frac{1}{2}$ feet deep gave the best results.

3. Soils remove most of the solids from water applied beyond soil saturation.

4. The water that does escape from soils by leaching is richer in the elements of fertility than before it entered, the amount so escaping, however, being so small that the total contains but a fraction of the solids applied.

5. Where water applied is small in amount, the temperature grows higher and higher on decreasing amounts.

6. Water applied to our gravelly soils appears to evaporate inside of twelve days.

Profit in Potatoes.—A farmer near the irrigating canal in Butler county, Idaho, is making a success of the potato crops. This year he has planted over forty acres (double last season's area, on which he made a profit of about \$75 an acre). With moisture in sufficient quantities this section is an excellent one for all kinds of farming.

The Sweet Potato Crop.—The sweet potato is one of the most valuable crops grown by the farmer, either for market or home consumption.

The value of sweet potatoes as a part of the ration allowed cows has not received the attention it de-

serves. They are one of the cheapest milk producers farmers can grow, and cattle are very fond of them. Potatoes for this purpose should be of the prolific sorts, like the Brazilian Yam or Southern Queen. Such as are intended for this purpose may be put up in the fields in small hills containing eight or ten bushels and will keep in excellent condition through the winter. When opened the contents of a hill can be moved at once to a bin in the barn for use. Plant sweet potatoes for the cows and pigs.

Sunflowers.—Experiments have shown that the common sunflower exhales twelve ounces of water in twenty-four hours. Roots of all trees draw large quantities of moisture from the soil, which is discharged into the air through the leaves. It is estimated that an oak tree with 700,000 leaves would give off something like 700 tons of water during the five months it carries its foliage.

Rabbit Pest.—Rabbits have been causing much damage to the wheat on the irrigated lands west of the slough in Fresno county. There is quite a heavy crop of grain in that section, and the long-eared pests have been mowing it down rapidly. Two drives have been made and 3,000 of the animals killed. These drives are to be continued at intervals.

Licorice is another plant that someone under the ditch may like to experiment with, and, it may be added, with a fine prospect of making a decided hit. It takes three years to realize from a licorice plantation, but one once started it is a permanent thing. Cuttings of roots three to four inches long are used for planting, the process being much the same as with hop roots. The world's supply of licorice now comes principally from Spain, but considerable is produced in the south of England.

The Louisiana cane sugar crop last season reached about 226,000 tons, the heaviest crop ever grown in the state. The beet sugar made in California last season was 17,569 tons. Experiments will be made with sugar cane in the valley of the Sacramento river, Cal., the present season, and it is believed the culture of cane may be found a profitable enterprise in some of the rich valleys of that state.

An electric mosquito bar has been invented by a Frenchman. Just as the mosquito touches it the insect receives a death shock.

Ninety-two acres of beets were planted in the vicinity of Chadron, Nebraska, and there are prospects of a good crop.

HORTICULTURE BY IRRIGATION.

UNSOLVED PROBLEMS IN THE FRUIT INDUSTRY.

BY W. C. FITZSIMMONS.

THE growing of fruits of every kind, suitable to the climate and soil of the United States, is rapidly increasing. In nearly every nook and corner of the country the fruit interest is becoming more or less prominent; and in many places where the industry was merely incidental a few years ago, it has now become a leading pursuit. The enormous consumption of wholesome fruits, in largely increasing volume from year to year, is the surest indication that the American people have gained some knowledge of dietetics and will never again be content with a coarse diet of pork and hominy and all that such a fare implies.

But, of course, there must be a limit to fruit-growing, no matter how great the facilities may be for merely producing even the choicest fruits. That limit is most nearly fixed by the cost at which the product may be placed upon the tables of consumers. With a proper standard of living for American citizens, either proprietors and employes or laborers for hire, the final cost of producing most varieties of fruit in the United States cannot and should not be very greatly reduced. In some cases the large proprietor, by operating in a wholesale way in all things and cultivating a large acreage, may produce fruit at a lesser cost per ton than the small orchardist whose system of management must be different. But the great orchardist should not exist. The best interest of the country demands that the farms and orchards be small, and that the owners and their families perform most of the labor required. Nothing approaching peon labor should be permitted, if possible to prevent it, among fruit-growing communities.

The successful fruit-grower must read. He must not be of the non-progressive element of our rural population who decry "book farming" and ridicule the farmer who reads farm journals. The farmer or fruit-grower who insists on learning everything about his business through his own experience will never know much.

One of the unsolved problems in fruit growing is that of placing the product in the hands of consumers at prices within their reach, while at the same time leaving a living margin in the hands of the grower. This is not merely a question of freight rates on the railways, and of commission men, as so many fruit-

growers believe. The question is a very much broader one, though it includes the two elements named. Primarily, the solution of this gravest question before fruit-growers must depend upon the producer himself. He must produce good fruit; he must so systematize his business that he can produce it at a moderate cost, and know what that cost is. It is probably true that not one fruit-grower in fifty knows what it costs him to produce a pound of any variety of fruit. If this be true, he should naturally have but little voice in fixing a price for his product, for he has little knowledge of its proper value, based upon the cost of production.

At this point, therefore, permanent coöperative organizations are essential. It has come about that single-handed and unaided efforts along nearly all lines of human endeavor are largely nullified through misdirection. A thousand men cannot move a ton's weight by each one exerting his own strength separately. With the united and simultaneous exertions of ten men the weight is easily moved.

The same principle holds good among fruit-growers. What ten thousand of them, acting as individuals, cannot hope to accomplish, may be easily brought about by a few compact units made up of the isolated individuals comprising the mass of men engaged in the business. Coöperation, then, is the first necessity in the direction of business-like and profitable marketing of a fruit crop. Indiscriminate consignments of perishable products to unknown commission houses is absolutely fatal to the business of production, and in the present condition of civilization and business morals must remain so.

This is not always the fault of the much-abused commission man. Ordinarily he has his full share of sins to answer for, but the fact that a shipper does not always realize his expectations from consignments is not conclusive evidence of dishonesty or incompetency on the part of the selling agency. Sometimes the shipper himself is to blame. His fruit is badly packed or graded and has been known to have the best specimens on top of the package. In fact, many who have given unprejudiced study to the question assert that "honors are easy" between the average consignor and the average consignee, so far as commercial integrity is concerned. The pleasure of denouncing the seller as a scoundrel has been so long enjoyed by the average shipper that it cannot be expected, perhaps, that he will without objection hold

the mirror up to nature and see how much alike most men are after all. Here is a case in point: For two years past the orange growers of Southern California had not been satisfied with the returns received from their crops, amounting to some 5,000 or 6,000 carloads per year, which were sold mostly to or by so-called commission men. So great was the dissatisfaction, much of which was fully justified, that the growers resolved that the crop now nearly marketed from that State should be handled by themselves and without the intervention of middle men. As a result of this proper determination, a number of coöperative fruit exchanges were formed to include nearly every one of hundreds of orange growers throughout Southern California.

These several exchanges were united into a principal exchange under an able board of managers, and the work of marketing the large orange crop was commenced. It was announced that fruit sent out by the exchanges would be honestly packed, properly graded and branded, and that consumers everywhere might expect good fruit at reasonable prices. Unfortunately a heavy freeze early in January greatly damaged the crop and absolutely ruined at least a third of it. Notwithstanding this well-known fact, frozen and nearly worthless California oranges have been in the Chicago and other markets by the hundred boxes every day for the past four months under the brand of "fancy," "choice," or otherwise, as the case might be. This fruit was packed and branded by growers, or under their direction and with their knowledge. Hundreds of carloads of damaged fruit have thus reached the markets of the country under false representations, not by the commission men, but by the growers themselves who combined, and properly so, to put a stop to dishonest practices in fruit marketing.

This case is cited in no spirit of hostility to the movement on the part of growers to secure better markets for their crops. On the contrary, they did wholly right to denounce dishonesty wherever discovered, and to organize to prevent it by force of numbers—but they should also have practiced honesty themselves.

The unfortunate and deplorable fact that they did not as a body do this should not wholly discourage those who, by looking deeper, will still see in coöperation the ultimate hope and success of the fruit industry. It serves at least one valuable purpose. It must dispel the illusion that orange producers are honest and that orange sellers are not. That is to say, it will emphasize the fact well known to all thinking men, that commercial integrity, or the want of it, is not monopolized by any class of citizens. This is an exceedingly valuable lesson, and until

fully learned all along the line of transactions in farm and orchard products, will continue to present obstacles to the satisfactory buying and selling of such commodities.

THE IRRIGATION AGE has previously pointed out the great difference between the prices received by the grower for California dried fruits, for example, and those paid by the consumer. This difference will generally be found to be entirely too great. Somewhere between the producer and the consumer there should be a lopping off of the prohibitory prices which so greatly restrict consumption. For instance, there is no good reason why California prunes of a certain quality should be worth 25 cents per pound in Chicago or New York, when the same goods can be purchased by the million pounds in San Francisco or San José at less than nine cents per pound. This is the whole difficulty in a nutshell, and no possible reduction in the costs of production can ever fully bridge this chasm. The consumer must not pay more but less for his fruit supplies, while the grower has already reached the bottom price at which he can continue in the business. It is not the purpose of this article to point out a specific remedy in detail. It is a very broad question and cannot be settled off-hand. But the basis of any action looking to a better outcome in this direction is organization. Coöperation, which guarantees strict honesty in all transactions, as between the growers and the market, and also demand the same from any and all selling agencies employed is the first requisite. This must be the foundation stone of any substantial edifice built up in connection with prosperous fruit industries in this country. With this firmly established in each fruit district, the questions of local detail will be found to readily adjust themselves. But the organizations must be permanent, and not liable to go to pieces whenever the whims or caprices of dissatisfied members may demand.

To be brief then, the only hope of permanent and gratifying success among the great body of American fruit-growers is compact organization and intelligent and honest coöperation toward the desired end. This done and adhered to through thick and thin, through prosperity and disaster, will ultimately win the fight. The American table must be supplied with choice fruit grown in America, and it must and can be supplied in unlimited quantity by prosperous orchardists at reasonable prices, to the end that every family in the land may daily lunch upon a dish of fine fresh or cured fruit at the breakfast and dinner table. When this happy day shall come, and it will come, and should come early, THE AGE will hope to number among its tens of thousands of readers the happiest, the most intelligent, and the most prosperous of business men — the fruit-growers of the United States.

EXPERIMENTS ON THERMOMETER EXPOSURE.

IT is a common saying among farmers and others interested in temperatures at various seasons that the United States weather bureau thermometers scarcely ever indicate so low a temperature during a cold wave as do private instruments in the locality. The cause of this conservatism on the part of the government thermometer is generally believed to be that it is a more reliable instrument, and has been graduated and tested with greater accuracy. Two observers, independently of each other, have made experiments in this direction which are worthy of note. One of these observers was located at Pasadena, in Southern California, and the other at Sacramento, the capital of the State. All government observers are expected to have their thermometers sheltered in a certain way, prescribed in the rules and regulations governing the weather service. In accordance with this requirement, the observer at Pasadena, Mr. H. S. Channing, had one thermometer placed 7 feet above a platform 12 feet square on a roof 32 feet above the ground. This was for the regular daily observations reported to the government bureau at Washington. A similar instrument was placed 5 feet above the ground on a post 5 feet away from the house and on the north side. The instruments were read at 5 and 8 in the morning. Mr. Channing sums up the matter as follows:

"The results of the observations taken on clear and comparatively still nights gave an average difference of 1.6 degrees lower temperature for the thermometer nearest the ground, the difference varying from 0.4 to 4.2 degrees. This last variation of 4.2 degrees occurred on one of the coldest and stillest nights of the month."

The observations at Sacramento by Mr. S. H. Gerrish disclose a condition of things somewhat unusual. In this connection Mr. Gerrish says:

"The idea has prevailed that a frost would do more damage in wet weather than when it was dry, and the irrigation of orchards has been suspended to 'harden the trees.' I experimented years ago and found to the contrary; that the damage was severe only when the ground was dry, the cause being that the northwest wind was negative in its electrical effect and sapped the positive or life-giving electricity from the plants. This weakened the vegetation so that a lighter frost would damage the plants more than a heavier frost when there was plenty of moisture."

Mr. Gerrish also presents an exhaustive table showing a comparison between the minimum temperatures at Sacramento, as indicated by two equally accurate thermometers, one of which was placed

some distance above the ground, as required by the weather bureau, the other being near the ground. The period covered by the observations was eighteen years, and ranged through the months of January, February, March, November and December of each year. The number of observations recorded is 463, in which 17 show that the thermometer nearest the ground registered a higher temperature than the other, and 12 observations show an equal registry for both instruments. In all other cases, 434 in number, the instrument nearest the ground showed a lower temperature. The average difference in readings for all observations was 5 degrees, showing that killing frosts might be safely assumed to follow a weather bureau record of 37 degrees. But the difference was very much greater in numerous instances, and reached in one case 14 degrees, and in another (Dec. 18, 1892) 16 degrees. In the latter instance the weather service thermometer recorded a temperature of 40 degrees, while the one near the ground fell to 24, a most remarkable difference. In another case, when the government instrument showed a record of 45 the other registered 31 (on Feb. 17, 1881). It will thus be seen that under ordinary conditions the records of temperature given by the government weather service are by no means an infallible guide to farmers and fruit-growers, and have no doubt given rise to much complaint of the inefficiency of the service.

Assuming that the *raison d'être* of the weather service is to aid the farmer and fruit-grower in connection with other important interests, it is here suggested that a great improvement might be made by having two thermometers at each observer's station, the one placed as now, but the other exposed in such manner as to record as nearly as possible the actual temperature prevailing at or near the ground, such as growing crops would necessarily be exposed to. The trouble and expense attached to this addition to the service would be insignificant, and much good could be made to result. The agriculturist is not especially concerned about weather conditions in the atmosphere many feet above his crops, but he is deeply concerned to know very often what degree of cold he may expect at or near the surface of the ground at a given time.

In view, therefore, of a condition which appears fully established by the observations made in California, THE IRRIGATION AGE would respectfully invite the attention of Secretary Morton to this matter, with the hope that further investigation be made to the end of improving the service along this line.

California fruit-growers have demonstrated that irrigation does not produce fruit of inferior flavor but that too much water does produce lack of flavor.

More About Spraying.—It may be quite possible that too great amounts of poison are used in the preparation of the mixtures ordinarily used for spraying fruits. Much experiment along this line has resulted in changing the formulæ from time to time of some of the most useful sprays. And it might easily result that still further experiment would lead to other modifications. One thing is clear: as little poison as will do the work in hand should be used. Beyond that point lies danger, as well as increased expense. It has been found that minute quantities only of our best insecticides are fully effective when duly appropriated by the insect. It may easily follow from this fact that weaker solutions more frequently applied would, in many cases at least, bring about the sought for result without endangering the consumer of fruit in any degree. Relative to this subject, Professor Kedzie, of the Michigan Experiment Station, says:

"The use of poisons in horticulture, in my opinion, is largely in excess of the amount required for a fungicide. One-half or even one-third of the amount usually employed would probably give as good results.

"In the spraying of some fruits, such as strawberries, in 1892, the amount was purposely used in large excess. In one case nearly five grains of blue vitriol were recovered from one pound of fruit—a dose no sensible person would want to take in his food. Yet, even that dose would not probably be fatal, though it might cause vomiting. Any of the doses of arsenic or of copper found in a pound of these fruits might be swallowed without endangering life by such single dose. It is the repeated doses, day by day, of such poisons that might produce slow poisoning and the gradual undermining of the health, without obvious cause. It is safe to refuse all fruits which have been sprayed with these poisons (especially arsenic) during the period of ripening."

Idaho as a Fruit Country.—The Producers Association of Nampa have gathered and compiled some interesting data with reference to the fruit acreage of Ada and Canyon counties. The association was unable to get reports from a number of growers, principally in the Payette valley.

The table prepared and printed by the association gives the acreage of trees set out from 1887 to 1893 inclusive, at 3,321.1 acres, of which 604.5 acres is apples, 86 is peaches, 2,388.3 is prunes, 120.2 is pears and 32.1 is cherries. The most remarkable increase is noticed in prunes. In 1887 there were 81 acres of prunes planted in the territory embraced in the two counties. In 1892 this had been increased to something over 1,135 acres, and, in 1893, 1,252 acres were set out. The largest prune acreage is at Orchard

Farms, where there are 414 acres. No record is made of trees set out prior to 1887.

English Sparrow Pest.—Every year there is a renewed agitation for the suppression of the English sparrow. Dr. C. Hart Merriam, the ornithologist of the agricultural department, says that the sparrow is now spreading rapidly over the fruit-growing districts of California, where, if repressive measures are not quickly inaugurated, it is destined to levy a heavy tax on the State. By far the best way to fight the pest is by the destruction of its nests and young. The breeding season is unusually prolonged, from four to six broods being commonly reared each year. The great strongholds of the English sparrow in towns and cities are the masses of Japanese and English ivy and Virginia creeper that cover the sides of churches and other buildings. In such places the sparrows nest by hundreds or thousands, according to the area covered by the vines. If these vine-covered walls are within reach of a hose pipe, multitudes of the young birds may be destroyed by thoroughly dousing the vines with water at night. By systematic and concerted efforts millions of young sparrows may be prevented from reaching maturity.

Palms can be used to advantage out of doors in summer if kept partly shaded from the direct rays of the sun, and it improves them; they come in in the fall in much better color and stronger and stiffer. Plunge the pots into a bed of ashes up to the rims underneath a shade tree and sprinkle the foliage often. Do not keep the roots soaked nor allow them to become dried out.

Small Fruits, such as strawberries and raspberries, require frequent and clean cultivation to produce the best results.

Hot Alum Water applied with a brush is said to be sure death to all insect life on fruit trees.

In irrigating orchards do not forget that cultivation is as essential as the application of water. Irrigated land requires more cultivation than that which is not irrigated, and without cultivation your crops are likely to be failures. The mistake of many beginners is that they cultivate too little and water too much; cultivate intensively and put on no more water than necessary.

Prof. L. O. Howard succeeds Prof. Riley as chief of the National Entomological Bureau at Washington. For sixteen years he has been Prof. Riley's first assistant. The bureau has been a great source of aid to the horticulture of this country.

PULSE OF THE IRRIGATION INDUSTRY.

CLIMATE AND SOIL OF SOUTHWESTERN TEXAS.

BY JAMES C. ATKINS.

SOUTHWEST Texas may be defined as follows: Commencing at Matagorda, a town on the coast about 100 miles southwest of Galveston, and following the coast line to the mouth of the Rio Grande, thence up the river to Eagle Pass and back in a straight line to the place of beginning, making a somewhat irregular triangle.

For the last thirty or thirty-five years this part of Texas has been in the hands of ranchmen, whose immense ranges have been kept for the use of their herds alone, to the absolute exclusion of the farmer and gardener. A large portion of these lands is now being put on the market at reasonable figures, and before long I hope to see this the finest country in the United States, blossoming like a rose and filled with people.

I say the *finest* country, for what place is there in the United States that can compete with us in climate, or in the earliness with which we can place our vegetables on the market?

We live in a country which lies on the verge of the temperate and tropical worlds. The chill of the winter wind and the fierceness of the torrid heat are not known here. The prolonged spring, the summer, tempered with the ever-pleasant and all-pervading cooling breeze, the genial, bright and sunny fall and uniformly mild and gentle winter, constitute a climate of constant enjoyment worthy of the highest appreciation. From the similarity of climate to that of southern Europe this country might be called the New Mediterranean. Especially is this the case at this point, Portland, which is situated on Corpus Christi bay, on bluffs forty feet above the level of the sea and about midway between Galveston on the north and Brownsville on the south. At both of the above named places the extremes of temperature are greater than at this point. At Portland the uniform summer temperature is, day after day, 84 to 86 degrees, rarely going above this, and then only to 90 or 92 degrees. Even this is hardly felt as long as we have the delightful gulf breeze. In winter our days are a succession of pleasant temperature of from 40 to 60 degrees, interspersed now and then by a norther, or north wind, when the temperature will fall slightly below 40 degrees, but rarely getting low enough for a frost.

We have three varieties of soil here: The white sand, composed of decomposed shell; a quick soil if it has plenty of water, but without strength to stand continued cropping without the addition of artificial fertilizers. This land is only found in the immediate vicinity of the coast, and consequently is very liable to drift unless protected by wind-breaks in the shape of trees.

Brown sand: This forms our staple market, garden and fruit land. It is a fine, rich loam and well able to stand continued cropping, and producing vegetables and fruits, such as grapes, peaches, plums, dates, oranges, lemons, bananas, etc., from three to four weeks earlier than California. No great quantity of these fruits has been as yet raised here, as the country has only been open to settlement within the past few years. Enough have, however, been planted to prove the above assertion.

In this county (San Patricio) there are two bearing vineyards, containing about 40 acres of wine grapes, from which is made some of the finest wine I have ever tasted in the United States. This wine will be better matured in three *months'* time here than in three *years'* time in California.

As far as I can ascertain, the first carload of water-melons shipped in the United States this year was shipped from La Fruita; in this county, to Kansas City, and Portland had the honor of placing the first car in Dallas on the 5th of June. I have just heard from Chicago that the first of the Georgia crop is not expected before July 15th. Over a month's difference. Our other vegetables are equally as early.

The Black or Hog Wallow land: This is similar in some respects to the North Texas black waxy or gumbo land, but has more sand in it, making it a great deal easier to work. It is a very rich soil, well adapted for cotton and corn, and capable of producing large crops for an indefinite number of years without fertilizing. This land holds the moisture very well and may prove to be very good for fruit. As is the case in all new countries, the sandy land is the first to be developed and experimented with, so in this case all fruits and vegetables have been planted in the sandy lands and the black land has only been allowed, to produce cotton and corn. However, I know of a few grape vines that have been planted in it and are doing well, being heavily loaded with fruit this year.

A great deal has been said this year in the papers about the great drouth in southwest Texas, how nearly all the stock was dead and that the people would be in the same condition unless help in the shape of supplies was sent at once. This is misleading to the general public as there is only a small portion of the country in that condition, viz: the county of Starr and part of Duval and Encinal, and I think that the reason of their destitution is at their own door. There has never been a time yet in the history of this section of the country that it has not been possible to raise a half bale of cotton to the acre where they have taken the trouble to cultivate the land. The white people of the above counties are not starving, though they have lost a great deal of stock, owing to the overstocking of their pastures, but it is the Mexican who has heretofore taken care of their cattle and who has been dependent on them for a living that is now in trouble. These people are too lazy to work land and raise enough to support themselves, and, in fact, would rather starve than do so. The rancheros do not wish in their own straitened circumstances to have to support them, so have made a great cry in the papers for help.

The United States weather bureau gives this place the mean annual rainfall for the past twenty years as 36.98; this is about the same as Iowa, Illinois, etc. Now if this rain was equally distributed throughout the year we would not feel the need of irrigation, but as it sometimes comes in rains of from two to six inches in 24 hours flooding the country and filling the rivers and then perhaps not another for a month or two. This is hard on market gardens. A good winter rain will start them nicely, then comes a spell of dry weather and they begin to suffer; perhaps some of the crop dies; then suddenly another heavy rain, or perhaps a light shower, neither of them doing one-quarter as much good as if we had a good irrigation ditch. If garden truck and fruits can be placed on the market ahead of California from two to four weeks under the above circumstances, what would be the results if we had irrigation?

There are three plants that I know of in this part of Texas, viz.: one at Brownsville, owned by Mr. Rabb, who uses it for irrigating sugar cane and bananas; one at Laredo belonging to the North Laredo Land and Irrigation Company, who irrigate about 500 acres and have most of it in grapes and a few gardens. The last and youngest of the three is about 40 miles from this place on the Nueces river. Mention was made in one of your late issues about the starting of this plant, stating that one hour and twenty minutes after starting the pumps the river was dry. This is a mistake. The pumps absorbed the flow of the stream and at the above mentioned time no water flowed below the plant. They have no dam and are depen-

dent on what water may be in the river between rains. If a series of dams were built on the Nueces river enough water could be stored to irrigate an immense quantity of land. If you will take the trouble to look at a map of Texas you will see that this river rises in the western portion of the State and consequently drains an enormous body of land, thus insuring a good supply of water.

Nothing can be said for or against this plant as yet, as it was started far too late to do any good to the crop of early spring vegetables. But by December it will have had a chance on the fall garden crop, and then we will know more about it. We have several other rivers and basins that could be utilized in this part of the country. There are a great many arroyos or gullies on the coast that could be easily dammed, some of them being of very great size and capable of irrigating a good deal of land.

The Aransas, Chittipin and San Antonio rivers could all be utilized, especially the two latter. There are several irrigation schemes under discussion at present and I look for the development of some of them before long. I also expect to see great strides made in the advancement of this country.

Give us irrigation and we will make California hustle to keep up with us.

OBJECT LESSONS IN IRRIGATION.

OBJECT lessons in irrigation are the most effective means of teaching the benefits to be derived from the labors of placing water upon arid land even under the most adverse conditions. The traveler from the East going west over the Southern Pacific line from Texas, after long and weary toiling over apparently endless wastes of arid land, suddenly comes upon the green alfalfa fields and fruit orchards of the Salt River valley in Arizona. The transition is so sudden and so complete that it is almost incomprehensible, and may well impress one as some trick of a mighty conjurer whereby barren wastes and endless stretches of wearisome desert are made to appear like fairy-land. After all, it is a substantial reality, and no magician has wrought the miracle.

THE WATERS OF THE SALT RIVER.

The prosy combination of the capitalist, the civil engineer and the man with the shovel have wrought it all out within a few months by turning the hitherto useless waters of Salt river upon the thousands of acres which now smile with their burdens of alfalfa and vines and fruit trees. Toiling still westward over other dreary stretches of inhospitable desert, the traveler climbs a pass in the Sierra Nevada range and then drops down into the valleys of the Sunset slope. But the great magician's wand has already

waved over that region, and behold, a million beautiful orange trees in all their semi-tropic luxuriance stand before him! It is Riverside. Riverside, the peerless, as her proud and happy citizens delight in believing. But what has been done at Riverside and Redlands and Ontario and the unrivaled colonial settlements 'round about can be accomplished, in a measure at least, on millions of acres of the arid belt. To be sure, the orange, the lemon, the fig and the pomegranate may not flourish over large areas, but that is not necessary, or even desirable. On every acre of such lands the apple, peach, plum, pear, grape and all the cereals and grasses will flourish luxuriantly, to say nothing of potatoes, melons and the endless line of vegetables, including sugar beets.

A TRAVELER'S VIEWS.

As showing how the startling transformations wrought out by the irrigation of a sandy waste, within a few years' time, strike a world-wide traveler, the following is clipped from a long and interesting letter by a well-known traveler, published in a late number of the *St. Paul Globe*:

"Riverside presents the most striking instance in Southern California of the marvelous transformation effected by scientific irrigation. The irrigation of land, which to a majority of the American people seems like a new idea, and one that is only adopted as a last resort, is in reality as old as history itself. It has been practiced in Egypt, in Syria and other arid sections of the old world from time immemorial, but never has been brought to such scientific perfection as here in Southern California. Twenty years ago the country around Riverside was a barren and desolate plain without house or tree, and was considered almost as worthless as the desert of Arizona. It was assessed at 75 cents an acre, and the owner actually appeared before the county board of equalization and protested, claiming that the assessed valuation was more than the actual value of the land. But by the ingenuity of man the waters of the Santa Ana river have been turned upon this arid plain, and the desert has been made to bloom and blossom as the rose. Vacant land that was considered dear at 75 cents would now be called cheap at \$500 an acre."

MORE INFORMATION ON "IRRIGATION IN THE CANADIAN NORTHWEST."

That the Federal government is keenly alive to the importance of data being obtained without delay is apparent from the fact that steps towards the organization of irrigation survey parties were immediately taken, and these are already in the field under the able supervision of Mr. J. S. Dennis, Chief Inspector of Surveys, to whom the inspection of irrigation works is also to be intrusted. This gentleman

was sent to all irrigation centers in the United States, last winter, by the Dominion government for the purpose of studying the question, with a view to its application in the Canadian Northwest, and also to collect material and valuable information for the final revision of the "Irrigation Act" prior to its introduction into Parliament for discussion.

The proposed irrigation survey of Southern Alberta and Western Assiniboia extends from the fourth meridian on the east to range 5 west of the fifth and from the international boundary on the south to township 29 on the north. Permanent bench marks will be established at all points where such are liable to prove useful as a basis for future irrigation operations throughout the district mentioned, and all rivers and streams cross-sectioned at various points. The rate of flow will also be measured by means of current-meters, and the volume of discharge calculated. In addition to this, the general topography of the country traversed will be carefully sketched in, and these topographical notes will extend as far as possible on each side of the line run, and the probable volume of all sources of water supply determined.

AN OPPORTUNITY.

Mr. C. E. Moorman, of Solomonville, Arizona, writes that he considers the present an opportune time for someone to engage in building an adequate irrigation system with reservoirs in that valley.

At present water is very scarce for irrigation, partly occasioned by too many ditches and a consequent loss of water in division and seepage in the bed of the river between dams. One undertaking this enterprise would probably find it best to arrange with each of the present ditches for their water and so consolidate the whole supply at the Narrows where there is rock bottom and sides where the river leaves the mountains, and then carry the water from a sufficient dam at this place some distance and all around the foot hills as far as was desired, possibly forty or fifty miles, making storage on the way, and at proper intermediate places construct lateral ditches supplying the present ones with water according to their priority in quantity and time of appropriation, and, if possible, acquire all such water rights and then rent the use of water as in other localities. The capital necessarily involved would be perhaps about \$150,000 to construct a proper and permanent system.

This valley is about 45 miles long and will average from three to five miles wide, and has now not one-half of the land irrigated, but the Gila could, with a proper system with storage, water the whole of the irrigable land throughout the whole season.

A railroad is now building into the valley which will be the means of opening the way for settlers.

Several artesian wells are being sunk in Cochise county, Arizona. A well near Benson found water at a depth of 275 feet. The residents in the eastern part of Pinal county along the San Pedro are watching the experiments with interest, for the same conditions are likely to prevail throughout the entire length of the valley.

The California method of developing and utilizing the artesian flow will doubtless be adopted on the San Pedro. By that method a series of six and eight inch wells is sunk along an artesian belt. The wells are capped and their flow piped to a penstock. Thence the water is conducted by pipes or open ditches to points of distribution. Frequently water companies are organized, purchase land in an artesian belt, develop a number of thousand inches of water, which are sold to land owners, at great profit to those investing in the company. Again, an owner of land in an artesian belt, by boring a few wells, finds himself completely independent of canal and water companies.

An automatic electric indicator is to be used to record the flow of water in the north fork of the river at Fort Collins, Colorado, and a daily report will be posted at the post-office for the information of those interested.

The extension of the Pecos Valley railroad from Eddy, New Mexico, to Roswell, eighty miles away, is being pushed forward as rapidly as possible, and is destined in time to become an important feeder of the road leading from the Pecos region, which, under irrigation, is becoming a very important agricultural district.

The Southern Pacific railroad is sinking an artesian well at Gila Bend. It is now 500 feet deep and arrangements have been made to go 1,300 feet, if necessary, to obtain a good flow of water. A supply of pure water will be a great help to the town.

The Kearney (Nebraska) *Hub* says: "If we live here we must irrigate." Nearly all of Arid America is now fully alive to the importance of irrigation, and they are wondering how they ever existed so long without it.

The Bear River Canal Company of Utah is operating a steam plow that turns over twenty-five acres per day near Corinne. This company will put 5,000 acres into alfalfa, timothy and fruit this fall.

Denver Congress.—The headquarters will be located in the Brown Palace Hotel, and the sessions will be held in the Broadway Theatre.

ADVERTISER WANTS POSITION OF TRUST with Irrigation company which requires a competent superintendent with long experience in handling water, also in vine and tree growing and general irrigation farming. Experience gained in California and New Mexico. Best references as to capability and character. Address, IRRIGATION AGE.

NEW COMPANIES.

Utah.—Weston—The West Cache Canal Company organized with Peter Mickleson, president, and P. J. Sandberg, secretary and treasurer.....Salt Lake City—Articles of incorporation of the Richards Irrigation Company have been filed. The object of the company is to construct and maintain reservoirs, water ditches, etc., particularly for Little Cottonwood waters and others in that vicinity. The stockholders all reside at Union Fort, and that will be the principal place of business. The property of the company consists of the waters of Little Cottonwood creek, now running through the Richards ditch, and the ditch itself. The officers of the company are Peter Van Valkenberg, president; Charles B. Baker, vice-president; De Morand Griffin, Jr., secretary; William A. Gogges, treasurer; and these, together with Ben A. Griffin, form the board of directors. Capital stock, \$12,500.

Colorado.—Denver—The Beaver Brook Reservoir and Canal Co. has amended its charter, changing location of reservoirs Nos. 1 and 2.....The Barton County Irrigation and Farmers' Institute has been organized by the election of W. W. Sowards, president; L. Baldwin, vice-president; M. B. Fitts, secretary; W. B. Cornell, treasurer. Steps will be taken at once to interest every man in the county in the work of organization.....Colorado Springs—The Roswell Land and Water Co., incorporated. Capital stock, \$500,000.....Pueblo—The Traders' Land Co., incorporated. Capital stock, \$5,000.....Fort Collins—The Laurel Street Lateral Ditch Co., incorporated, improving Laurel street lateral ditch. Capital stock, \$1,000.

Nebraska.—Elm Creek—A local irrigation company has been organized here.....Culbertson—Riverside Canal and Irrigation Co., incorporated. Capital stock, \$10,000.....Fremont—Fremont Canal and Power Co., incorporated. Capital stock, \$1,500,000.....Omaha—The Elkhorn Irrigation Co. have let contracts for the construction of ditch south of Elkhorn river. Work will begin at once.

Texas.—Corsicana—The Corsicana Water Development Co. has been incorporated with a capital stock of \$30,000. The company is sinking an artesian well, which has now reached a depth of 300 feet.....San Angelo—Veck Irrigating Co., incorporated. Capital stock, \$10,000.

New Mexico.—Las Vegas—Las Vegas Water Co., incorporated, supplying water for irrigating, etc. Capital stock, \$500,000.

South Dakota.—Deadwood—The Black Hill Canal and Water Co. is inviting bids for the construction and building of a 650-foot tunnel at the head of Sawpit Gulch, through the ridge to Sheeptail Gulch. Tunnel to be five feet wide and six feet high.

Oregon.—Lake View—Windy Spring Irrigation Co., incorporated. Capital stock, \$2,000.

California.—Bakersfield—The Lowell Land and Improvement Co., incorporated by Wilmot Lowell, Herman Hirschfeld, H. A. Blodgett, A. C. Mande and T. E. Harding. Capital stock, \$100,000.....Monterey—Monterey Power Co., incorporated by P. P. Oyer and others. Capital stock, \$100,000.

Washington.—Walla Walla—The Headley Irrigation Co., incorporated by C. P. Headley, P. P. Pearson, Willis Riser, to acquire, build and sell irrigation ditches, flumes and reservoirs. Capital, \$600, in 600 shares of \$1 each.....Ellensburg—Address James G. Boyle, secretary board of directors of the Middle Kittitas Irrigation District concerning the sale of \$200,000 worth of bonds for construction of canal.....North Yakima—North Yakima Canal Co., incorporated. Capital stock, \$60,000.....

CANALS.

Arizona.—The announcement is made that the contract to construct 110 miles of canal, with a dam 150 feet high, at Horse-Shoe Bend, Verde river, 60 miles northeast of Phoenix, has been given to P. B. Langdon & Co., of Minneapolis, Minn. The land to be brought under irrigation amounts to several hundred thousand acres and will add materially to the cultivated area of Arizona. Two million dollars are to be expended, and the work will probably be accomplished in eighteen months. The capacity of the canal will probably be 57,000 miner's inches.....Chief Justice Baker recently made an examination of Salt river and the various headgates therein, all the way to the Arizona dam. His object was to obtain personal knowledge of the amount of water in the river and its distribution to farmers on both sides, so that in case any legal questions should hereafter arise in his court concerning irrigation he may have a practical understanding of the issues involved.

Colorado.—The Fort Morgan canal has finally been turned over to the farmers, who are now in full control.....The Mount Lincoln Land & Water Company has been sending out to the landholders under their survey a circular letter and form of contract for their consideration, and if a sufficient expression of interest is manifested in the enterprise by these people, the work on the High Line canal will be at once commenced and pushed to a finish. The cost of the canal will not be less than \$600,000, and the ditch will be operated by the High Line Mutual Irrigation Company upon the same principle and basis as the Grand Valley Irrigation Company, but it will be built by the Mt. Lincoln Land and Water Company upon certain considerations, viz: That a sufficient number of landholders under the survey will contract to take stock in the irrigation company. The survey covers 110,000 acres of land not covered by other canals; perhaps 75,000 acres are tillable. The promoters of the enterprise say that there will be no hitch in its consummation if once they are assured of co-operation of the land holders.....An encouraging amount of work has been and is being done on the High Line canal, better known as the "Sterrett ditch." This canal draws its supply of water from Brush creek, and empties it into Cedar creek, after which it is again taken out at a point lower down the stream. The canal is completed to a point two miles north of Cedar creek. The work of making the canal to a width of twelve feet on top is being pushed as rapidly as possible, and it will be enlarged afterwards as the needs of the community demand. A ditching machine is being used in this work which will make two miles of ditch per day one foot in depth and four feet wide. A number of parties here in town and in the surrounding country have located land under this canal and are working out their water rights. This arrangement offers a splendid opportunity for a man of small means to secure a water right in return for labor. There are thousands of acres of as good land as is to be found anywhere, under this canal, and the terms are reasonable upon which both water and land can be secured by parties seeking homes. This canal, as surveyed, covers an immense tract of fertile soil, which is within a few miles of an abundant supply of dry pine timber and also near this town.

California.—Plans (except for the head works) for completing the main canal of the Modesto District to the present terminus of the canal have been received. The engineer estimates the cost of this work (headgates excepted) at about \$137,000. It is largely composed of expensive fluming.....Col. Adolph Wood, of the Arrowhead Reservoir Company, says: "We expect to have completed in about three months two tunnels, one 6,000 feet and the other 2,000 feet in length, and the entire system will require several tunnels, as we propose to carry the headwaters of the Mojave river across the drainage area into the valley. We

are now gauging our rainshed, which is about forty miles in extent, and four camps are at work in a thorough system of measurement, so that we may know just how much water to depend on and just how large to make the capacity of our works. These important matters have been overlooked too much in California either through the cupidity of land boomers or lack of knowledge, and I fear the present dry season is going to prove a disappointment to many who have bought land with an assurance of water supply which they are not going to realize. This season is an excellent opportunity for Southern California to ascertain the 'duty' of perennial streams in time of greatest need, and this will, in a great measure, shut off future misrepresentations about the supply of water.".....The South Riverside Land and Water Company has decided to dig a canal to draw water from Lake Elsinore. It will be 2,200 feet in length and will cost about \$7,500.The Santa Ana Valley Irrigation Company is putting in a division gate at the head of the canal. The work is in charge of the Superintendent, assisted by the Superintendent of the Anaheim Company.....The Grapeland irrigation district reports a flow of about two hundred inches of water in the company's tunnel. The tunnel is being run in a side canyon from Lytle creek, through an intervening hill and under the bed of Lytle creek, intending to tap, not the water of the creek but the underflow of the canyon. Water was secured before the creek was reached, and now this heavy flow has been secured and the tunnel has not yet reached bed rock into several hundred feet. The tunnel is about 1,200 feet in length and connects with five or six miles of stone-paved ditch that will conduct the water to the district. The amount expended on the tunnel has been about \$15,000.....This is an unusually dry season, and 200 inches now means considerable more than at any other season. If this strike has been made without tapping or diminishing the surface flow of Lytle creek it will prove one of the most important events in the history of irrigation in this part of the State.

Idaho.—We learn that the survey of the Crook Irrigation Company's ditch has been completed. When the estimates are submitted the landowners who are interested in the enterprise will be able to form some idea of what the cost of water is going to be under the proposed system.

Nebraska.—The supervisors at a late meeting held in Fremont decided to build the Reynolds waterway.....Culberson—The Solomon & Crews ditch is furnishing an abundance of water. The ditch was constructed late last fall by private enterprise, tapping the Frenchman river, and lately the water was turned in at the head gate, reaching the east end within the corporate limits of Culberson within a short time, and the water is now being utilized to irrigate hundreds of acres of land in the valley.....The contract has been let for the construction of the irrigation ditch south of the Elkhorn river by the Elkhorn Irrigation Company and work will begin in a few days. The contract provides for the completion of the ditch by Nov. 1, 1894. It will irrigate one of the prettiest sections of the country, comprising over 90,000 acres.

Utah.—Wasatch—There are about 2,000 acres of land unprovided with water that could be covered by a canal taken out of the Provo river near the bridge on the Park City road. By the building of this canal the wealth of Wasatch county would be increased \$100,000 within the next few years, besides furnishing employment for a number of the citizens and homes for a hundred or so more families. A company is being organized to undertake the work.

Wyoming.—The Brockway ditch enterprise has been incorporated under the title of the Fetterman Canal Company. Active work has begun and will continue all summer, the force at work being increased as found necessary.

PUBLISHER'S DEPARTMENT.

WHAT COULD BE DONE WITH 100,000 ACRES IN KERN COUNTY, CAL.

READERS of THE IRRIGATION AGE believe the industrial problems of the United States will be largely settled in Arid America. If that is so it becomes interesting to inquire in what localities the new developments may be looked for.

Obviously there must be many localities to come into prominence in the process of making homes for millions of people in order to provide a real outlet for surplus population and found a new civilization worthy the name.

These localities will be scattered through half a continent, beginning in Kansas on the east and the Canadian boundary on the north. But it is quite safe to predict that California will continue to maintain its place as the most attractive of all western commonwealths to the multitudes of the East and of Europe.

CALIFORNIA'S POPULARITY.

It is not difficult to understand the causes of California's preëminent popularity. It has never lost the glitter which the discovery of gold gave it in 1849. The public has never outlived the first impression of its sunny skies, golden fruit, luxurious vegetation and winterless climate. Its proximity to the further and greater ocean, which laps the shores of Occident and of Orient, gives California a nameless charm in the popular imagination. There may be other lands under the wide arch of the western sky equally interesting, but they are not equally well-known and appreciated. California is to-day, and for some years must continue to be, the irresistible magnet to attract homeseekers into new and promising fields.

THE BEST PART OF CALIFORNIA.

But if it is indefinite to say that Arid America will furnish a field for the solution of current problems it is only less so to say that California will be a conspicuous place in that field. Next to Texas California is the largest state in the Union. It presents every climate to be found upon the globe, except that of the equator. Eternal winter and perennial summer may both be found within its boundaries. Surely there is need of guidance for the settler who thinks of making his home in California.

The writer knows of but one place in the Golden State where land is under irrigation and open to settlement in sufficient amount to render it capable of demonstration in a marked degree the possibilities

of the policy of colonization in connection with our industrial situation. This land is located in Kern county which is in the southern third of California. It is enclosed on three sides by the Sierra Nevada and Coast Range mountains and is abundantly watered by a stream taking its rise at the foot of the glacier of Mt. Whitney. Here is a tract of 350,000 acres, varying in the nature of its soil, but everywhere fertile and adapted to the higher forms of horticulture and agriculture.

The irrigation system includes more than a thousand miles of canals and ditches and yet is as simple as the mill race a boy builds by the side of a brook. It is turned out of the river into the canals by the simplest of weirs and conducted by main and lateral canals over the entire property. In many respects this is the finest opportunity for settlers offered in all California.

WHAT CAN BE DONE WITH 100,000 ACRES.

If it be true that an outlet can be found for surplus population on arid lands, and that a scheme of industry can be devised whereby these people can become independent and evenly prosperous, then surely the fact can be demonstrated to the satisfaction of the public on say 100,000 acres of Kern county land. In Kern county the farm unit may well be twenty acres. An area of 100,000 acres would provide homes for 5,000 families, or 20,000 people, counting four to a family. Whatever can be done by 5,000 families on 100,000 acres of Kern county soil we may properly accept as truthfully representing the highest possibilities of Arid America.

Practically just such an experiment will be made between this time and August, 1894.

WHAT IS BEING DONE IN KERN COUNTY.

The Kern County Land Company is represented in many large cities of the United States, Canada and Great Britain. Its agents are directing the settlements of homeseekers by every proper and active means. Backed by ample capital and by the solid merits of their proposition, they ought to accomplish the settlement of 100,000 acres of land this year. It is not necessary, in order to get successful and significant results, to try the experiment on so large a scale. But it would have more influence

with the world if 20,000 people found prosperity on 100,000 acres than if 2,000 on 10,000 acres.

Several attractive colonies have been laid out in Kern county, and the experimental farms have been carried to a stage which warrants settlers in applying their lessons. Settlers who go there to-day will have the benefit of the best instruction of experienced and expert farmers. This is a wonderful advantage, and the results of this liberal policy will certainly justify it.

PRICES AND PRODUCTS.

Prices of Kern county lands range from \$60 to \$100 per acre, which includes a perpetual water right. The products include everything, except citrus fruits, and there are certain limited areas where the latter flourish. The writer would predict that the small diversified farm will be the final outcome of Kern county experience, but the surplus product will be peaches, apricots, olives, raisins and alfalfa. A very low and conservative estimate of the profit per acre from any of these sources, except alfalfa, would be \$100. The products of Kern county lands, including the costs of growing them and the prices they bring in ordinary times, were very fully treated in these pages last month.

WHERE THE STRIKE DID NO HURT.

It was understood that the California fruit growers were heavy sufferers by the recent railroad strike, which was more effective and for a longer period there than elsewhere. Bakersfield and its surrounding Kern county colonies are on the main line of the Southern Pacific railroad. Traffic was seriously interfered with there, but there was no occasion for the fruit of the vine and tree to perish. Nearly everything grown on these lands can be dried and sold profitably at the grower's leisure. This is true of the raisin grapes, the peaches, the apricots and the prunes. Nothing except a drouth could seriously affect Kern county, and the ditch is an insurance against that calamity.

The intending settler can obtain full particulars about everything relating to home-making in Kern Delta by addressing S. W. Furgesson, General Manager, Bakersfield, California.

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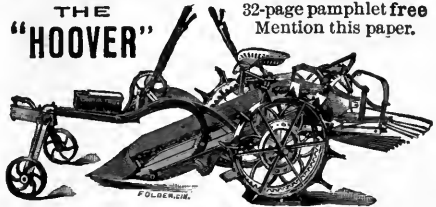
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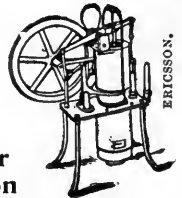


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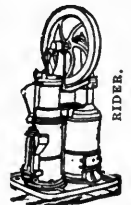
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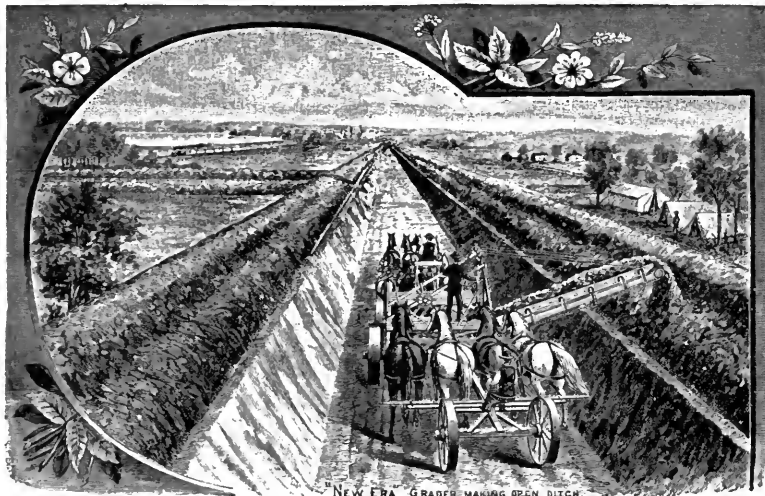
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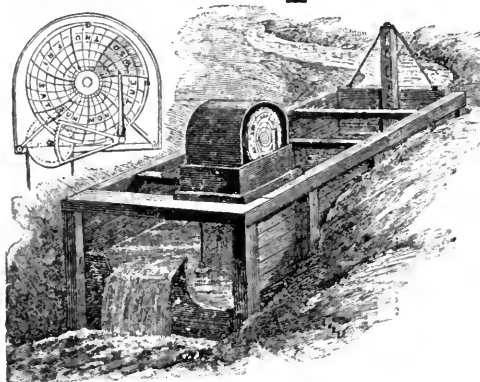


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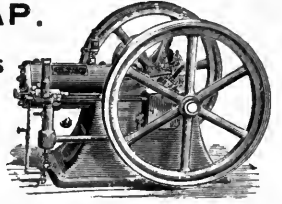
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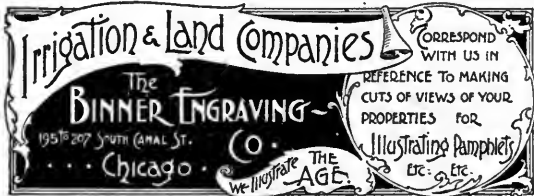
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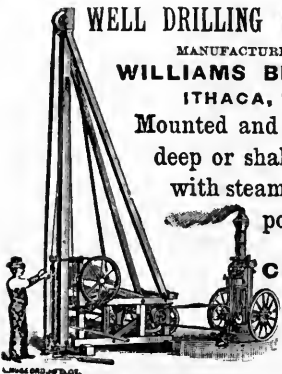
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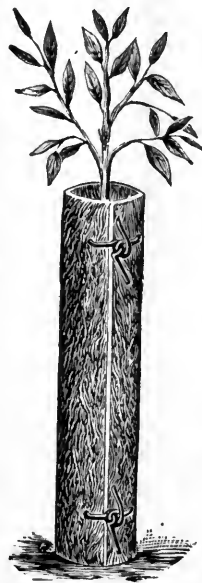
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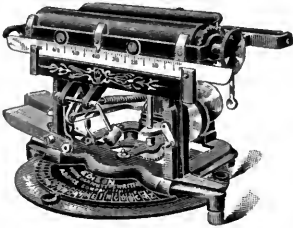


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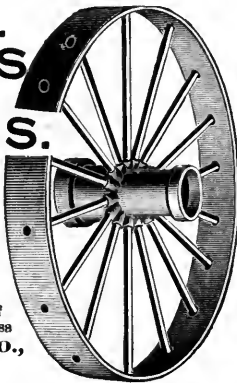
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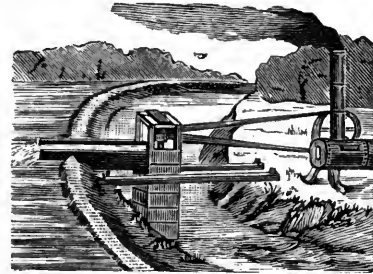
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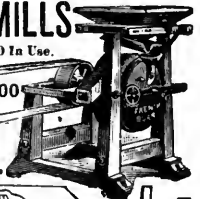
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THE IRRIGATION AGE.

VOL. VII.

CHICAGO, SEPTEMBER, 1894.

No. 3

THE PROGRESS OF WESTERN AMERICA.

*The Storm
and the
Shipwreck.*

Now that the representative men of the West are upon the eve of assembling in their annual congress at Denver, the time seems opportune for a studious review of the industrial situation in the great region lying between the Missouri river and the Pacific ocean. It is now about fifteen months since the American people realized that they were in the throes of a grave financial and industrial panic. When the lightning was first seen along the sky, late in May and early in June, 1893, it was generally felt that there would be a shower and a blow and that that was all. Slowly and sternly the fact was carried home to all classes of people, and to all sections of the country, that we had encountered one of the equinoctial storms which, at rare intervals, sweep the seas of commerce and industry. The acute stage of the tempest was necessarily over in a few weeks. All the leaky crafts, and many a noble ship as well, went down in the fierce onslaught of wind and wave. Every craft that was not well ballasted and closely reefed, or snugly harbored, was eliminated, West, South and East. It is plain that the storm has blown itself out, and yet the skies have not cleared, nor the angry waters subsided. The inflation has dropped out of everything except the gold dollar. We are now in the process of readjustment. Men differ concerning the immediate future. The writer has had, perhaps, unusual opportunities to study the outlook from various points of view during the past year, having divided his time rather evenly between the Atlantic and Pacific coasts—between the far northeast and the far southwest.

*No Peace
in Sight
Yet.*

There is certainly some ground for hope of at least a temporary revival of business activity, especially in the manufacturing States, from now until January. The surplus stocks have been reduced to a very low point and must be replenished in some degree. The tariff truce at Washington—and it is scarcely more than a truce—will in a measure relieve the strain and encourage manufacturers to go ahead, at least cautiously.



HON. C. C. WRIGHT, OF CALIFORNIA,
Author of the District Law known as the "Wright Act."

Beyond this nothing can be said with confidence. It is useless to cry peace when there is no peace. It is folly to shut our eyes to the great truth comprehended in Garfield's saying: "Unsettled questions have no pity for the repose of nations." It cannot be said that the tariff is settled, but rather that the process of unsettling it has just begun. The primary cause of the great panic was said to be the fear of investors that our currency would be debased by the coinage of a limited amount of silver under the Sherman law. Putting wholly aside the merits of that question, let us admit the obvious truth that capital was frightened

by the existence of the Sherman law. How then must capital feel when it beholds the hourly growth of the sentiment for the free and unlimited coinage of silver by the United States, with or without the consent of the European powers? If the investor was afraid of one little pill, how will he be affected by the sight of a whole bottle of pills? The fact is undeniable that the free coinage movement is stronger to-day than it was when the fierce demand for the repeal of the Sherman law induced the President to convene Congress in extra session in August of last year. The great West is unanimous for it, from the Missouri river to the western sea. The South is overwhelmingly in favor of it. Organized labor in every great city of the North and East is preparing to desert old political idols and to fight for it. It is not yet certain that the silver cause will prevail, but it is certain beyond all possibility of successful dispute that it is a hundred times more menacing to-day than it was when the Sherman law practically bounded the possibilities of silver coinage.

**Stable Con-
ditions Years
Hence.**

Under tariff and silver lie deeper questions, also, of continental dimensions. Does anybody believe that the mighty forces so recently marshalled at the mouths of mines, at the doors of factories and along the lines of railways have been permanently subdued? If so, he is greatly mistaken. There is a place where the gatling gun and the judicial injunction do not restrain the individual will, and that place is the ballot box. Again leaving the merits of the question wholly aside, only the blind can deny that the great industrial forces which shook the whole fabric of industry and commerce in July are to-day crystalizing in the form of political potentialities. They may succeed or they may fail, as the tariff may be preserved or destroyed, and as silver may win or lose, but they will continue to be pitiless of national repose, and hence we can expect no return to the solid ground of universal confidence and activity for a long time to come. We should predict that the earliest hour when anything approaching enduring conditions can be reached will be the close of the presidential election in 1896. We are more inclined to predict that the election of 1900 will usher in the era of peace and settled conditions. The new century will come in with a blaze of glory, but the old century will die amid the din of warring elements, political, social and industrial, but not—we hope and believe—physical.

**Outlook in
Western
America.**

This brief review of general conditions is a necessary prelude to an intelligent consideration of the situation in Western America. The panic weeded out weak banks, stores and other commercial enterprises, and the fall in silver closed the largest mines. Staple agriculture went down with the money of the people, bringing the

wheat-grower and cotton-planter to the perilous edge of ruin. Forty-three thousand miles of railway, mostly in the West and South, fell into the hands of receivers. It hardly needs to be said that under such circumstances most enterprises in process of development stopped short, while the brood of ambitious new undertakings hid their diminished heads. As a result of all these things everything in the West is down to hard pan. Only the glorious climate and the eternal mountains have gone through the past fifteen months without apology or change. Now, what of the future? So far as the tariff and silver issue are concerned, the West is in the same boat as the rest of the country. It can merely vote and patiently await the outcome. The one western product for which there is a boundless demand is gold, and this will be mined with the utmost energy wherever it can be found. Is there any respect in which the destiny of the West is very largely in its own hands, so that it is possible for its people to proceed with the expansion of their industrial life, their population and their wealth, regardless of the menace to business confidence which must continue for an indefinite period, or until gold or silver, protection or free trade, the fanaticism of capital or the fanaticism of labor, are decisively disposed of at the polls? Has the West any



F. H. BRIGHAM, OF OREGON.
Member of National Executive Committee of Irrigation
Congress.



SENATOR WHITE, OF CALIFORNIA,
Chairman of Committee on Irrigation and Arid Lands,
U. S. Senate.

single resource which can be developed by its own brains and faith and which the rest of the world is willing to acquire on terms within its means, and the more so because depression prevails? This is the vital question for Western America at this hour.

What Can be done Without Capital. After taking full account of every drawback, including heavy interest charges, comparative poverty and sparseness of population, THE IRRIGATION AGE unhesitatingly asserts that the people of Western America are to-day in a position to be more independent, and to more greatly enhance their prosperity, than are the people of any other section, not excluding New England itself. This is rather a bold statement. We have not been in the habit of looking at things in just this light. We have said, "We have boundless resources, if we only had the money to develop them." And then we have sent our agents to the East and to Europe to float mortgages against the future. This is all right in ordinary times. The mortgages are good. They justify the confidence of the investor and the faith of the promotor. But we are not living just now in ordinary times, but in very unusual times. This is a good season to be working out the plans for future enterprises, and to be educating certain investment circles with a view to obtaining their coöperation at a later period. But it is idle to talk about obtaining large amounts of means for the average project to-day. Now, then, is there anything which

the West can do without delay and without attracting large amounts of new capital? Yes, it can utilize the surplus millions of land already under ditch, but not yet under cultivation. It can develop the highest forms of agriculture and horticulture under irrigation, and fill its valleys, already watered, with tens of thousands of prosperous people. It can come down from the clouds and grapple with problems of the earth, by which we mean that its enterprising citizens can postpone the making of their millions to a more favorable season, and satisfy themselves by helping to increase the common prosperity, taking modest profits for their own labor and pains. There are countless opportunities for new enterprises of all sorts, but these can wait. In the struggle to make new things we have forgotten or neglected to utilize those already made.

Surplus Millions Un-occupied. Look at Colorado. She is a candidate for money in the markets of the world. She ought to be a candidate for people in every agricultural district and factory town of the over-crowded East. According to the figures of 1891, Colorado had under ditch 3,007,500 acres and under cultivation only 1,800,000 acres. The latter figure included some large areas. Practically Colorado has to-day not far from 1,500,000 acres of irrigated land waiting for the settler. California has about as much more. Arizona's surplus irrigated soil mounts up in the hundreds of thousands of acres. Idaho has a million acres ready and waiting for the husbandman,



A. G. KINGSBURY, OF FLORIDA,
Member of National Executive Committee of Irrigation
Congress.

according to official figures; New Mexico about 500,000; Montana about 500,000; Utah, 250,000. There are also very large areas in Nevada, Oregon, Texas, Washington and Wyoming. In the aggregate these lands, irrigated but not occupied, represent investments amounting to tens of millions of dollars. The fact that they have not been occupied, that the water appropriated has not been fully used and that the soil reclaimed has not felt the electric thrill of human labor, is the only reason that irrigation securities are not to-day in eager demand, in spite of the hard times. These unoccupied irrigated lands are an unworked mine of western prosperity. If within the next twelve months, as the result of common effort and well-directed energy, these lands could be settled with industrious people, three great results would quickly follow: First, every western State and territory would realize instant prosperity from the influx. Second, the congested population in the East would be relieved by the withdrawal of between 2,000,000 and 3,000,000 people. Third, irrigation investment would be so handsomely vindicated that millions of eastern and foreign capital would speedily seek investment in new enterprises, for when the tide is once turned in the direction of Arid America nothing can stop it until the last acre is occupied.

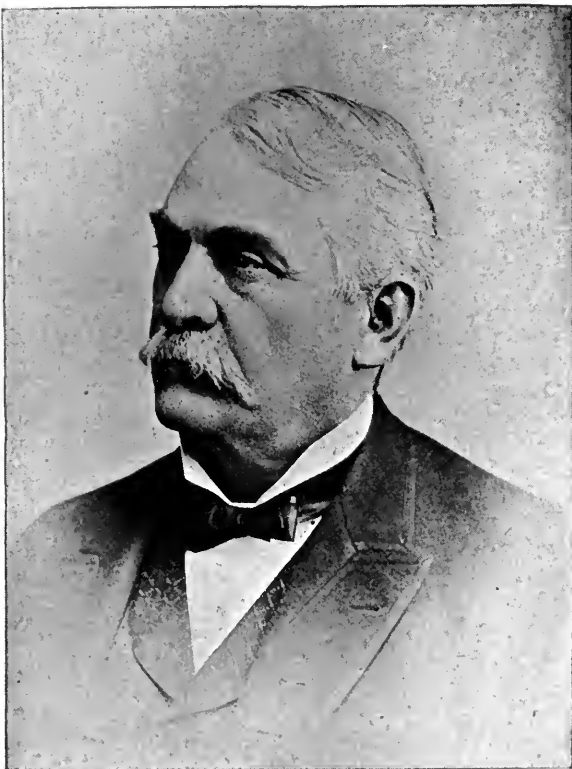
***The West
Enviably
Independent.***

No such opportunity to snatch victory from the jaws of defeat—to stampede depression by sheer force of pluck and brains—is offered to any other part of this country. The eastern and middle States, and all of the older portions of the South, are sustaining as much population as they can profitably employ. When they adopt irrigation, as they surely will during the next century, they will be on a par in some respects with Western America. Under the present forms of industry they cannot materially expand, and even such expansion as they do make must be at the expense of the people already there, coming through the form of greater distribution, which means the taking of something from those who have in order to give to those who shall come in. It is only in the arid and semi-arid localities that the highest opportunities of the average man can be realized in the immediate future. This will be done by the development of communities of small farms where the products will be diversified and intensified by scientific methods. We should hold steadfastly to the highest ideals. We should bend our intelligence to the task of solving the problems which confront the settler in a new country. Every State, and even every small community, should have a colonization policy. It should have expert irrigators and farmers employed in the development of experimental farms, illustrating the highest possibilities of the soil and climate. The story of Arid America and its institutions should be carried to the

utmost parts of the earth. To realize benefits from this policy of aggression we need not wait supinely for more money to be invested in new enterprises. If the new enterprises we contemplate will pay in the future, then those already constructed will pay now. Successful colonization will not only assure prosperity for to-day, but guarantee ample financial backing for to-morrow.

***The Very
Stars Fight
for Irrigation.***

The stars in their courses are fighting for irrigation. The hot winds have rolled up from the gulf and devastated the corn fields. Large portions of the country north of the Ohio river, from Minnesota to the Valley of the Potomac, are covered with brown and stunted crops. Even in New England an almost rainless summer has oppressed the farmer with fears of coming hardships. The writer saw suggestive evidence of this fact while riding through the Berkshire hills of Massachusetts recently. He observed a grizzled farmer, followed by his two stalwart sons, carrying buckets of water in their hands from the hillside spring to pour upon the parched earth and save



PARIS GIBSON, OF MONTANA,

Member Irrigation Commission, and "Father of Great Falls."



ELWOOD MEAD, OF WYOMING,

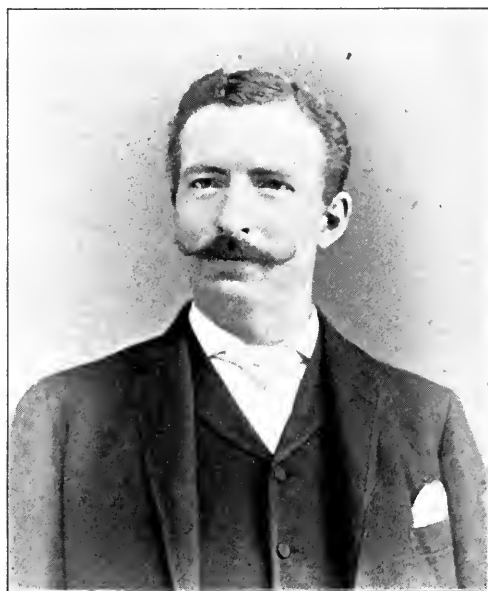
State Engineer, Chairman Wyoming Irrigation Commission,
Member of National Committee.

a corner of their garden patch. Perhaps these Yankees did not know it, but they were irrigating, though by a very primitive mode. They were resorting to the great law of self-preservation. In this instance they were seeking to preserve only a garden patch, which meant a portion of their living through the coming winter. But irrigation will be resorted to for self-preservation in a much larger sense. The division of land and the intensification of crops will yet become a prime factor in the preservation of our institutions. It must be instantly resorted to in order to preserve the industrial life and safeguard the prosperity of the corn-belt States. While the arid western half of the continent will be the theatre of action, we shall witness the gradual extension of ditches and canals over eastern and southern farms, and the time will come when the blessings of independence and equality, of neighborhood association, with all its valuable social concomitants, and of the other advantages inseparable from irrigation, will be generally distributed throughout the United States. For Arid America it is the golden moment of opportunity, but for the whole country on the side of irrigation hopes it is the hour of dawn.

Even King Corn Surrenders. A study of western newspapers convinces us that at this moment the liveliest irrigation field is the semi-arid State of Nebraska. Nebraska is hard hit by the drouth and the scorching winds from the South. Corn is king in Nebraska, but this year he totters on his

throne. We hope the time is near when he will be relegated to his proper place in a more republican form of agricultural development, which will admit a number of equal factors and forever banish the mistaken philosophy of the single crop. The best forms of prosperity can never be realized by the one-crop country. The rule is that when there is plenty of corn the price is too low, and that when the price is high there is little corn. There is only one thing worse for a community than a period of bad times, and that is a period of riotously good times. Both are evils. Communities, like individuals, thrive best when prosperity is moderate, but even and secure. If bad times bring despair, too good times bring that quality of mental intoxication which destroys thrift and fosters extravagance. The eastern third of Nebraska has a fairly reliable rainfall and the western two-thirds can raise good crops without irrigation every few years. These conditions do not permit of diversified agriculture in the highest sense. Nebraska is by nature a corn and cattle country. Nature must be improved upon, or rather nature's resources must be wisely manipulated by the genius of man, to give to Nebraska the full benefits of her rich soil and climate and her favorable situation in relation to the markets.

Nebraska Water Supplies. Of all the semi-arid States, by which we mean the two Dakotas, Nebraska, Kansas, Oklahoma and Texas, Nebraska is most fortunately endowed with water supplies. The amount of land that can ultimately be irrigated will



T. D. BABBITT, OF IDAHO,

Member National Executive Committee Irrigation Congress.



HON. J. W. GREGORY, OF KANSAS.

Vice-Chairman National Executive Committee and Chairman
Kansas Irrigation Commission.

be a large total in acreage, though as nearly all of the State would be capable of cultivation if sufficiently watered, the area reclaimed may seem small in comparison to the whole. The amount of water flowing in surface streams, such as the North Platte, Republican, Frenchman, Loup, Niobrara and Missouri, is immense in the aggregate. The possibilities for individual irrigation plants from underground sources are also very large indeed. The storage of storm waters is feasible to a considerable degree. A State irrigation policy, superintended by expert ability and faithfully persevered in over a series of years, would put into the hands of Nebraska's people irrigation facilities that would seem fairly astounding if predicted now.

It is understood that petitions are in circulation requesting Governor Crouse to summon the Legislature in extra session to devise a State irrigation system. This announcement will bring a smile of quiet satisfaction to those who were prominently engaged in the Nebraska irrigation campaign of 1890-91. During that winter a group of perhaps twenty men, mostly of the western counties, but including a few from Omaha and the southeast, organized a widespread agitation in favor of the immediate development of a State irrigation policy. Many county conventions were held and finally a splendid gathering in the State House at Lincoln. The leaders of the movement were deter-

mined that Nebraska should have the benefit of the most enlightened experience of the world, and to this end they studied the laws and customs of Colorado, California, Utah and Wyoming, of India, Egypt, Italy and Spain. Under the midnight lamp they worked out a system of laws and administration. Just as the movement seemed to be at the doorway of success it was observed that a thunder shower was gathering in the West. It rained. It rained for several days. In fact the summer of 1891 showed a good rainfall rather evenly distributed throughout the State. Down went the irrigation policy and the fond hopes of its advocates, for Nebraska declared that the climate was changing. If 1891 had been a drouth year Nebraska would be to-day in the heyday of prosperity. She would have comprehensive canal systems, would have thousands of small irrigated farms and would today be attracting more homeseekers than any other western State, for when it comes to the business of blowing her own horn Nebraska is an artist. Her light is never hid under a bushel, but is always hoisted to the top of the highest liberty pole, while the vociferous outcries of her citizens attract the attention of the world. Is Nebraska now to go back and take up the old work? This question has already been answered in part. The work accomplished during the past few months, under the vigorous leadership of Mr. I. A. Fort, of North Platte, is very considerable and reflects the highest credit on that gentleman.



JUDGE J. L. VAN DERWERKER, OF ARIZONA,

Member of National Executive Committee Irrigation Congress.



P. H. PORTER, OF TENNESSEE.

Member of National Executive Committee Irrigation Congress.

**Nebraska's
Industrial
Future.**

Let us assume that Nebraska means business this time. What will be the character of the changes wrought in her economic life by the adoption of irrigation? It will be a revolution. The quarter section will come down to 80 acres, then to 40 acres, and ultimately to 20 acres. The Nebraska farm will no longer be merely an insignificant segment of the cornbelt. It will be in a modest sense a sovereign republic, for within the limitations of his own little farm the landed proprietor will be independent. He will learn from Utah the philosophy of diversified crops, and will try to produce nearly everything his family consumes. Then he will laugh in the face of panics as well as in the face of dry years. He will learn from Southern California scientific methods of irrigation, and so will intensify the product of each acre to the last degree. He will learn from New England the social advantages of thickly populated communities. The result will be a new kind of civilization and the gradual evolution of an American commonwealth, which will withstand every shock and strain that can come with time. The people of Nebraska should look forward to the next ten years as altogether the brightest in their history. There should be no faltering this time. All sections of the State should stand shoulder to shoulder, and the best talent of the people should be consecrated to the work from this time on.

**"Tom"
Patterson's
Nightmare.**

The *Rocky Mountain News*, one of the principal daily newspapers of Denver, publishes in its issue of August 3 an article under sensational headlines, alleging that the

chairman of the National Executive Committee has packed the Third National Irrigation Congress so that it may execute his will. It alleges that the gentleman who has thus neatly put the destinies of Western America into his vest pocket proposes to turn them over to corporations, to which he is said "to be bound hand and foot." It can be said to the credit of "Tom" Patterson, the distinguished editor of the *Rocky Mountain News*, that he is never dull, but always picturesque and interesting. Even his nightmares are entertaining. And this one is no exception to the rule. The chairman of the National Committee thought so well of the dramatic interest contained in this article that he ordered marked copies of it sent to all officers of the congress and to the leading newspapers of the arid region. It is hoped that the result will be increased attendance at the congress. If it were possible for every man, woman and child in the arid region to attend the result would be vastly pleasing to the officers of the Irrigation Congress. If these people are about to be robbed of their heritage the least courtesy that can be shown them is to invite them to be present to see how the thing is done.

**The Truth
about the
Charges.**

The article in the *News* is based on an alleged interview "with a gentleman of national reputation." This "reputation" is so delicate and fragile a thing that its owner hesitates to exhibit it in the desiccating air of the arid region. But let that pass. The charge is that the call was framed so that the Chairman of the



M. F. MERCHANT, M. D., OF NORTH DAKOTA,

Member of National Executive Committee of Irrigation Congress.



L. M. HOLT, OF CALIFORNIA,
Member of State Irrigation Commission.

National Committee could name the controlling delegates. The fact is that the call was prepared exactly in accord with the instructions unanimously adopted by the last Congress. The instructions were drafted by Judge Gregory, of Kansas, a most determined opponent of land cession. The chairman of the committee which reported them was the Hon. Lionel A. Sheldon, of California, another pronounced opponent of land cession. The Congress which adopted this basis of representation as the arbitrary rule for the next Congress was claimed to be overwhelmingly opposed to land cession. Never was there a charge more absolutely groundless and unreasonable than this charge that the chairman manufactured a call for his own ends, in order that the lands might be ceded to the States. The truth is that the last Congress intended that the body which was designed "to suggest a satisfactory irrigation policy to the nation and to the States and Territories," should contain at least seventy-seven men who had devoted a year's time to the careful study of the subject. With the selection of these men the chairman of the committee had just as much, and no more, to do as his twenty-two colleagues of the national organization. The parties who inspired this virulent newspaper attack must be very anxious to have a row. They will be accommodated if they will make application at the proper time and place.

**Powell
Speech
Recalled.**

The reassembling of the Irrigation Congress recalls the sensational incident of Major Powell's speech at Los Angeles.

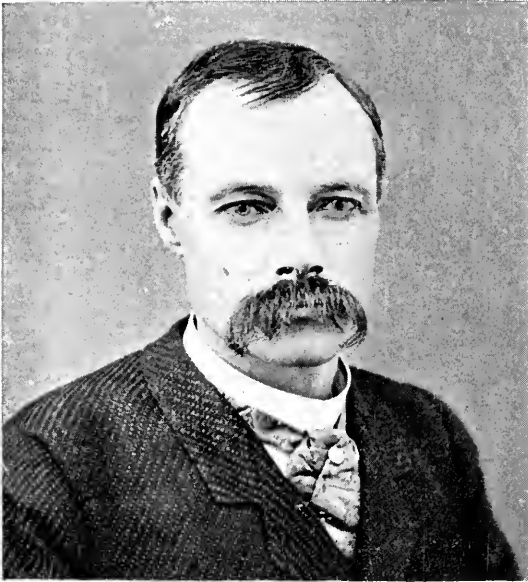
We think there is now no desire to recall it with a

view to its discussion in a spirit of bitter antagonism to its author. When the speech was delivered he was the Director of the Geological Survey, and by far the most distinguished man in the government service interested in the subject of irrigation. His speech carried the weight not only of his reputation, but of his official position. It was felt, and justly so, that his words would do infinite harm to the irrigation industry by discrediting every project which proposes to water government land, and by undermining the basis of economic facts which the Los Angeles declaration had set up as the ground for its faith in a future civilization to be created on the arid public domain. Those who followed Major Powell in violent and denunciatory speeches may have been unduly bitter, but they were at least sincere. They arose to defend a cause very dear to them, and naturally they spoke with great feeling. Major Powell is not now the Director of the Geological Survey. His official connection with irrigation is a thing of the past. What he has done for Western America is a matter of history. During the past year *THE IRRIGATION AGE* has sought to combat Major Powell's startling statements in a way that seemed to us to promise the best results. We were early satisfied that mere denunciation would avail nothing. The statements were true or false, well-grounded or mistaken. The public was immensely interested in knowing the facts.



WM. H. ROWE, OF UTAH.

Member of National Executive Committee and Pres. Salt Lake Chamber of Commerce.



I. A. FORT, OF NORTH PLATTE,
President of the Nebraska Irrigation Association.

Major Powell was invited to explain the meaning of his speech by a series of scientific papers in these pages. This was done because his speech was contradictory in many respects, and it seemed impossible to grasp its real meaning. It seemed best to ask him to carefully restate, with all the enormous facilities of his office about him, his views of the water supply in relation to private and public lands in the arid region. At the same time several authorities on the subject in various States were asked to prepare articles setting forth their views, and several practical irrigators were invited to put Major Powell's statements against the facts learned in actual experience. *THE AGE* has been severely criticised for having opened its pages to both sides of the controversy, but the number of commendations received for its course far outweigh the criticisms. But neither criticism nor commendation will alter the editorial policy of this journal. When great fundamental facts are at issue—facts going to the root of our industrial development—they will be fully and fearlessly discussed from every standpoint in these pages. When the evidence is all in the public will be able to make an intelligent verdict and *THE AGE* to express conclusions based on something tangible. We have received during the past year many articles both for and against Major Powell which have not been published. Some of them have not been published because space would not permit us to devote more attention to the subject without encroaching upon other interests that deserved representation.

Some of the best papers, prepared at the special request of the editor, have not been used because it was found that there was practically no ground for difference between the writers and the revised statements of Major Powell. Notable instances of this kind were papers prepared by Elwood Mead, of Wyoming, and John E. Jones, of Nevada.

We will not devote elaborate space now to a review of the subject, because we feel that the injury done has already been largely repaired. But since the subject may come up at Denver it is well to briefly state the grounds of the controversy. The sentences of Major Powell's speech which gave most offence were as follows:

There is not water enough and never can be; a quantity of water can never be conserved sufficient to irrigate more than one-third of the land already owned by private individuals. *Not one more acre of land should be granted to individuals for irrigation purposes.*

If you irrigate the land yet remaining in the hands of the government you have got to sacrifice some of the land remaining in the hands of individuals.

We think even Major Powell's most devoted friends must admit that this statement, coming from a high government official, was extraordinary and startling. We think we can show that in the light of his later and more carefully studied expressions it is simply incomprehensible. Taken at its apparent significance, it would end all thought of a public land policy, destroy most of the new enterprises, and crush the hopes of many great States. But see how easily it



WILLARD E. ALLEN, OF ILLINOIS,
Member of National Executive Committee Irrigation Congress.

can be demolished. In his April article in these pages Major Powell says (page 149, volume six, *I. A.*) that the total area of arid and sub-humid lands is 763,800,000 acres. He estimates that of this great arid empire there have passed into private ownership 148,900,000 acres. Remember, he said at Los Angeles, that "there is not water enough, and never can be, to irrigate more than one-third of the land already owned by private individuals." We have seen his estimate of "the land already owned by private individuals"—less than 150,000,000 acres. One-third of this is less than 50,000,000 acres. Now, in a parallel column, he estimates the available water supply at 75,000,000 acres, which is an increase of 50 per cent. upon his Los Angeles statement. True, he qualifies this statement by saying that "it would be impracticable" to apply all of this water. But here opinions may differ, especially upon the vastly important question of the duty of water. We think Major Powell must have disappointed himself when he came to figure the lands in private ownership and the water supply, as these figures certainly fail to connect with the Los Angeles speech. The duty of water is as much the basis of an estimate of the extent of the water supply as the number of second feet that can be obtained for purposes of irrigation. Major Powell, of course, saw this very clearly, but in his statement of the scientific basis of water duty he made a startling blunder on which he seems to have based all his subsequent reasoning. He said that "an acre inch of water weighs $11\frac{1}{3}$ short tons." This statement had no sooner reached the readers of *THE AGE* than scores of letters began to pour in reminding us that an acre-inch of water weighs ten times that amount, or 113 tons. The mistake was purely mathematical, but as the entire train of reasoning appears to have been erected upon it, it was none the less fatal to the scientific exposition. Furthermore, instance after instance of practical experience have been quoted to show that the crops thrive all over the arid region with far less water than science seems to demand. When practical experience lies open before us the deductions of science to the contrary do not count. Science might demonstrate that oranges would not grow in Riverside, but those who have picked the perfect fruit from the Riverside trees would merely laugh in the face of science.

Maj. Powell Answers Himself. But we need not go into fine-spun theories to answer Major Powell of Los Angeles with Major Powell of Washington. The former said, "not one acre more should be granted to individuals for irrigation purposes." In his April article he concedes that Wyoming has water for at least 5,000,000 more acres than has yet been taken by private owners; that Montana has water for at least 2,000,000 acres more; that Idaho



CHARLES P. ROSS, OF NEBRASKA,

Member of National Executive Committee of Irrigation Congress.

has water for at least 3,000,000 acres more. Everybody knows this to be true, and more than that, everybody knows that in every State west of the Missouri river, possibly excepting Kansas and Nebraska, there are some arid lands yet remaining susceptible of easy irrigation. This fact is so patent and notorious that when it is placed beside the bald statement in the Los Angeles speech the keenest intellect is unable to comprehend how the original statement could ever have been made. Other discrepancies in the speech are also easily susceptible of detection by the layman. In saying that there was not water enough "to irrigate one-third of the lands held in private ownership," it was implied that all land so held is irrigable. Nothing could be wider of the truth. Vast portions of railroad selections and land grants lie in high mountain districts and other places that can never be irrigated. The simple truth is that the arid regions are full of unexplored problems. No one has ever measured the mountain snow fall, estimated the artesian possibilities, gauged the winter floods, or carefully calculated the innumerable opportunities for storage. There is much more to be learned about the economical use of water. But in the

midst of the unknown there are sufficient established facts to deprive the Los Angeles speech of its very essence and to justify every hope which the men of the arid region have held out to the world.

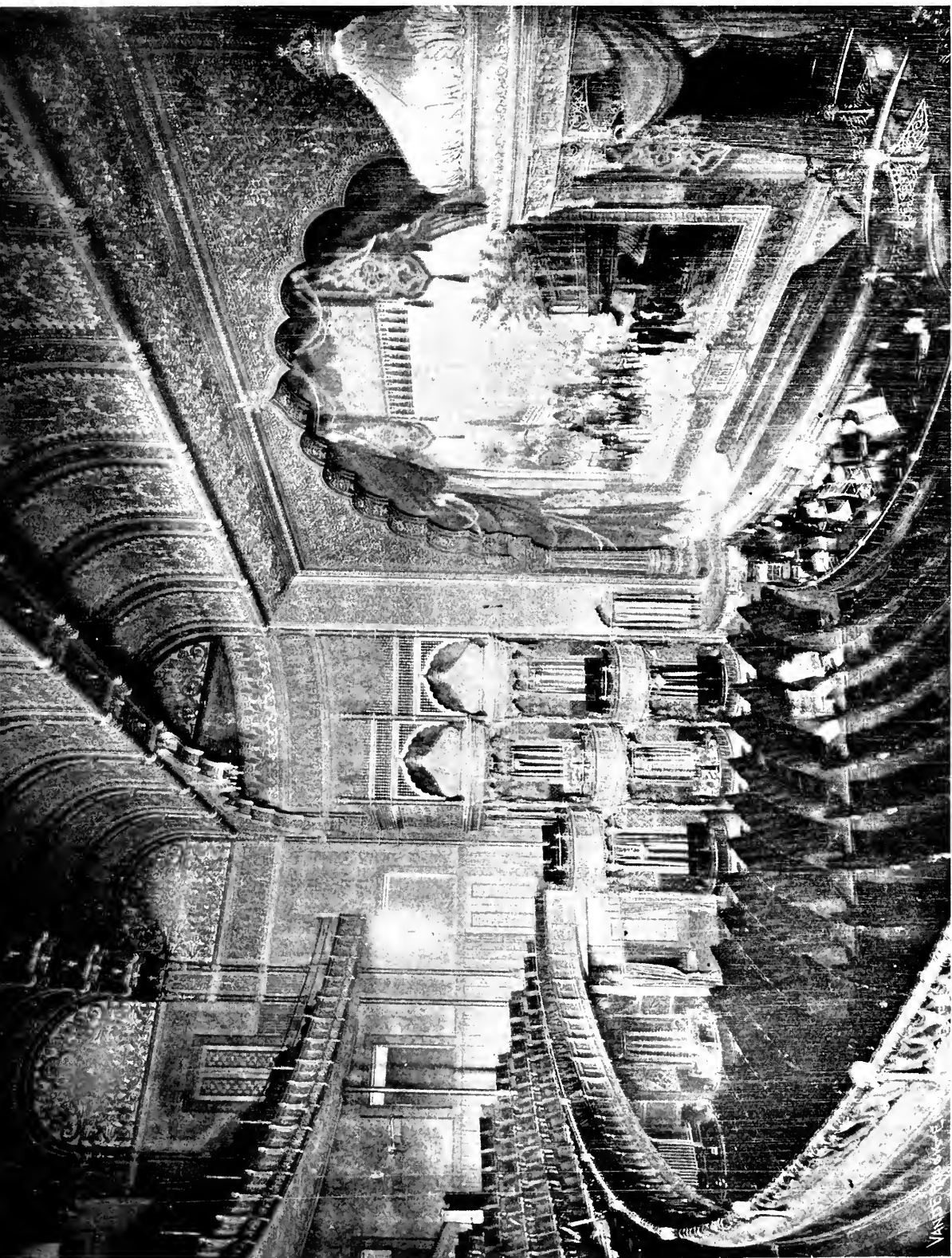
The Vital Point is Conceded. The leaders of irrigation thought have asserted that they can make homes for millions of people in the western half of the continent. They have said that they will give new life to popular institutions and evolve new forms of civilization. And when Major Powell emerges from the deep and narrow canyon of statistical lore, and steps out on the wide plain of human judgment and conviction, he demonstrates that there is, after all, no difference between his predictions and our hopes. After making every deduction and bringing down the estimate of water supply and irrigable lands to the narrowest limitations, he says (page 65, volume six, *I. A.*): "When these acres are cultivated by methods of irrigation they will be found wonderfully productive, and their products *will support a population as great as that found in the United States at the present time.*" That is to say, we can support in Arid America at least 65,000,000 people. If there is water and land enough for that, then there is sufficient to justify every claim which has ever been made by western men. Major Powell has indicated his intention to be present at Denver, and we predict that he will have a cordial reception and that his great knowledge and experience will be freely drawn upon during the process of formulating plans and policies.

The Interstate Association. One of the most important movements of the past year has been the vigorous campaign carried on by the Interstate Irrigation Association, whose headquarters are at Salina, Kansas. The president of this organization is E. R. Moses, of Great Bend, a gentleman of the best Kansas type, by which we mean clear-brained, energetic and boundlessly enthusiastic. A very large number of conventions have been held and the association has maintained a creditable organ, *The Irrigation Farmer*, edited by J. L. Bristow. The work of Hon. J. S. Emery, national lecturer, has been principally carried on under the auspices of this organization. Judge Emery has been very actively engaged in this work, and has constantly grown in usefulness and influence. Besides Messrs. Moses, Emery and Bristow, the executive committee in-

cludes A. W. Stubbs, of Garden City; J. K. Wright and Prof. Robert Hay, of Junction City; B. A. McAllaster, Omaha; John E. Frost, Topeka; R. Harding and G. W. Clements, Wichita; Thomas Knight, Kansas City; I. A. Fort, North Platte, and Alston Ellis, Fort Collins, Col. This is one of the strongest executive boards ever organized in the West, and it is unnecessary to go beyond a study of its *personel* to understand just why the movement in the semi-arid region has been so vigorous and successful this year.

Kansas has High Hopes. The Kansas people are confronted by many difficulties in the development of irrigation plans. There is a vast expanse to be watered and but a very meager discharge of surface streams to meet the demand. The best streams flowing into Kansas are already utilized nearer their sources. And yet Kansas is determined to irrigate and, in the end, we believe will develop a system which has some very marked advantages over those prevailing elsewhere. The windmill and pumping plants in the neighborhood of Garden City foreshadow the coming system of western Kansas. A few years will show us a vast number of these individual plants, and while it is more difficult for the farmer to provide himself with the means of irrigation at first under this method than it is for him to tap a lateral flowing from some large canal, in the end he is more independent in every sense of the word. In another department of this journal Judge Gregory descants upon the advantages of the Kansas plan as illustrated in Finney county. The coöperative plan of irrigation, suggested by Mr. John G. Steffee, of Wichita, in the June number of *THE IRRIGATION AGE* also promises to do a great deal for western Kansas. Under this plan farmers would have their homes on a quarter-section which can be thoroughly irrigated, this area being divided into ten acre tracts upon which they could raise a variety of products necessary to the support of their families. They would then operate the outlying farms, getting fair crops in some years. The ten acres of irrigated soil would save them from the disaster now so frequently encountered under the prevailing system of dry farming. We have the highest hopes of the success of irrigation in Kansas upon the lines now being urged by the various associations, interstate, state and county.





BROADWAY THEATRE, DENVER, WHERE THE SESSIONS OF THIRD IRRIGATION CONGRESS WILL BE HELD, SEPTEMBER 3 10, 1894.

SHALL WE HAVE "THE DENVER COMPROMISE?"

BY WILLIAM E. SMYTHE.

THE Third National Irrigation Congress at Denver, September 8-10, offers to the people of Arid America the only good opportunity they have ever had to lay the foundation for enduring institutions. Neither at Salt Lake City nor at Los Angeles, where the two previous sessions of the congress were held, were the circumstances favorable to the best results. On neither occasion was the time ripe for action. The people of the West were not ready to formulate an expression of their best judgment, nor were the people of the United States ready to listen. Both of these essential conditions are now at hand. After years of agitation which, during the past year, has been directed through well-defined channels to well-understood ends, the western people are ready to suggest definite outlines for their future institutions, and the day has come when manifest destiny compels the country to listen, not only with sympathy, but with anxious ear.

FROM SALT LAKE TO LOS ANGELES.

Two years elapsed between the first Irrigation Congress at Salt Lake City and the second Congress at Los Angeles. It cannot be said that these two years were employed to the best advantage. This was due in part to the torpor of the National Committee, but more largely to prevailing conditions. During that time the mining industry absorbed the attention of the western mind to such a degree as to render it almost impossible to attempt a serious study of irrigation. The country as a whole was in a state of fair prosperity, and was not seeking new outlets for surplus population. The time was not yet ripe for the great advance. The Los Angeles Congress pursued what was then thought, and what still seems, the wisest of all possible courses. It recognized the wide differences between those who favored a national and those who favored a state policy of administration. It realized that it would be impossible to evolve from a five days' session results fit to prove enduring. It formulated a statement of principles which may be briefly summarized as follows:

1. Water in natural channels and beds is public property. The right of use exists but not the right of ownership.
2. Water companies are common carriers, subject to the supervision and control of the power from which they derive their rights.
3. Private works of irrigation may be condemned under the exercise of the power of eminent domain, and taken for public uses upon payment of just compensation.
4. Inter-state streams must be conserved and equitably divided among the States which they naturally supply under Federal authority.
5. Mountain watersheds should be rigidly guarded and preserved through the agency of the national government.

6. The public lands are the heritage of the American people, not the spoil of speculators. There can be no just law for the disposal of these lands except one that recognizes the right of every American child to have a home upon them without paying unfair tribute to the capital that reclaims them.

This is by no means the whole of the Los Angeles declaration, but it is the essence of it on the vital questions that will underlie future irrigation policies. The convention then authorized the creation of seventeen commissions, one for each State and Territory in the arid and semi-arid regions, and charged them with the duty of investigating local conditions in connection with the study of the broader question of national policy. These commissions were charged to report at the next congress, which assembles in the Broadway Theatre, Denver, September 8.

The distance traversed by the irrigation movement during the period intervening between Los Angeles and Denver is prodigious. The question has suddenly risen to one of national prominence. In several States the commissions have performed splendid services, and in all they have accomplished enough to justify the hope that riper judgments will be brought to Denver than to any previous convention. Industrial calamities throughout the country have prepared the way for the inauguration of a splendid movement of national dimensions.

THIS IS THE HOUR OF FATE.

It requires many years to bring any great public question to full maturity. A long period of thought and discussion is essential in the shaping of laws and customs, and it rarely happens that the problem is ripe for solution before the nation is ready to solve it. If the western people had perfected an irrigation policy five years ago the country would not have been ready to enact it into law. But the preliminary stages have been passed. The time has come. The opportunity must be taken at this fateful moment. Mighty changes come swiftly when they come at all.

I have studied the situation from ocean to ocean during the past year and have taken observations among all classes of people. I tell my fellow-citizens of the West that this is the hour of fate for us. Let the tide be taken at its flood. And let us remember that we are to build, not for ourselves alone, but for the long future. The policies which we enunciate at Denver, if they be wise and just, will rule the destinies of Arid America when we shall sleep within her soil.

EXISTING CONDITIONS ARE INTOLERABLE.

The existing conditions throughout the arid region are totally inadequate to the demands of our new civil-

ization. We have no land policy worthy of the name. We have no proper supervision over the appropriation of precious streams, nor over the construction of works which, in case of sudden disaster, would endanger life and property. We have no common system of administration, nor even a common unit of measurement. The conditions surrounding our development are complicated and complex.

The Desert Land Law is a fraud and a disgrace. Under its baneful operations the most valuable desert lands are being steadily acquired for speculative purposes, to be sold back to the people whose heritage and birthright they are supposed to be. It is not asserted that the Desert Land Law has never been properly used, but it cannot be disputed that in the vast proportion of instances it has been operated as an instrument for the aggrandizement of the promoters of private enterprises.

Allow the present conditions to prevail and in a very few years it will be more difficult to find an acre of valuable public land than it is now to find a buffalo, since the latter are occasionally discovered in museums. Leave things as they are and every stream will be found to have been over-appropriated, every forest will have been denuded, and half a dozen States will be in arms against their neighbors, fighting for their share of inter-state streams. But that is not the worst. There will be a new form of monopoly which will hold in its iron grasp the source of life to every field, orchard and garden hereafter to be spoken into existence upon deserts now unoccupied.

Up to this time no great injury has been wrought. If capital has obtained great advantages it has taken great chances and illustrated great possibilities. Only about 280,000,000 acres have gone from the people so far, and of that amount about 80,000,000 acres comes under the head of railroad selections and other land grants. Nature was so prodigal when she laid out this continent that an empire is still left on which the genius of statesmanship may illustrate its capacity to deal greatly with great problems. But the time has come when the task must be begun.

THE OLD CONTROVERSIES.

Western irrigation sentiment has been sharply divided between two factions holding widely different opinions. One faction has insisted that the national government should appropriate all the money required in the work of reclaiming the public land and administering canal systems when built. This faction is unwilling to trust the States with any authority over the public domain, and especially over streams rising in one State and flowing through others. It maintains that irrigation is and will always be national in its character. If this view is to prevail in the West, the Desert Land Law should be instantly repealed, as otherwise there would be no public do-

main to be reclaimed when the people of the East are at last persuaded to appropriate millions for its reclamation.

Another faction, despairing of enlightened legislation, and especially of the granting of enormous appropriations, has favored the cession of the lands to the States, in order that each commonwealth might deal with its own problems. This faction has believed that the result would be the development of intelligent State policies. There is the best of reason to believe that the present national administration and Congress would readily agree to the plan of cession if now urged with anything like unanimity by the people of the West.

I do not believe either of these extreme views ought to prevail at Denver. Surely no man who has had good opportunities for forming a judgment can for a moment believe that in the present condition of the national finances Congress will make the necessary appropriation for this work. Neither can any man familiar with all shades of western opinion now believe that the plan of cession contained in the Warren bill can command the support essential to success before the country. Even if it could command it the measure would go into operation in an atmosphere of distrust—a condition most unfavorable to the best result.

I believe we have sufficient brains and tolerance to arrange a compromise between these two views which will be satisfactory to all. Let us see for a moment what are the main points in these two contentions. Those who demand national control say that this is necessary in order to prevent the acquisition of the lands by corporations. They also feel that there could be no just and equitable management of inter-state streams, forest reservations and pastoral lands, except under Federal authority.

Those who favor State control insist that irrigation must forever be purely a domestic concern, like roads and bridges. They say that to the West it is a vital and local issue, and to the East a vague and remote interest. They say that the lands in Colorado, for instance, will always be occupied by citizens who will look to Colorado for protection, and that these lands will always pay tribute into the treasuries of Colorado, and that the profits arising from the products of her soil will always be distributed in Colorado channels. They refuse to believe that works can be as wisely constructed under national authority as under State control. They are especially firm in their conviction that after the lands are actually reclaimed and actually settled the irrigation system can be administered much more wisely by the agents of the State than under Federal authority.

I think fair-minded men will concede that there is reason in both of these arguments. Now, can a way

be found which will give us most of the benefits of both systems and few of the evils of either? I believe it can be. I have urged from the hour of the Los Angeles Congress, and urge now, that the final solution must be a system which permits the lands, the inter-state streams and the forests to remain under Federal control, while the States are given large powers of administration. When I say that the lands would remain under Federal control, I mean, of course, that the settler would obtain title through the national land office, as now, but I do not mean that when the lands are reclaimed and settled the federal government should have anything to do with them. I do not now present the details of the plan of compromise which seems to me feasible, but leave that for the developments of the Congress. Let us wait for the reports of the state commissions and the intellectual friction that will follow.

THE CALIFORNIA DISTRICT SYSTEM.

The District law of California, should command the careful study of the Denver Congress. It has not been altogether successful in its practical operation, but its foundation principle is in harmony with the spirit of the times. It puts irrigation plants on the

same footing as city water supply under municipal ownership. I have always insisted that Mr. Wright and his followers were carrying out a great experiment for the benefit of the arid region. I believe the time has come when the results of this experiment should receive the most thoughtful consideration. Perhaps the time is very near at hand when the principle must be practically applied in a way which will avoid the weaknesses that have developed during the last seven years.

"THE DENVER COMPROMISE."

The alarm has been sounded to the effect that land-grabbers will control the Third National Irrigation Congress and shape the deliberate verdict of the West. Let the men of the arid region gather in such numbers as to render impossible the betrayal of the trust committed to this congress. The land-grabber does not usually operate through the medium of public meetings. Let us have a large and representative convention. Let us patiently hear every honest view, and then let us get together, in a spirit of honorable concession, draft a measure worthy of the mighty West and send it into history as the Denver Compromise.

FEATURES OF THE IRRIGATION CONGRESS.

PREPARATIONS for the Third National Irrigation Congress, which will assemble in the Broadway Theatre, Denver, September 3, are being rapidly pushed, both by the national and local committees. Indications are favorable to the most important gathering which has ever met in the name of irrigation. The times are ripe for a great forward movement, as the West is ready to say what it wants and the country, under the pressure of events, is at last ready to listen. The programme of the seven days' meeting will include the following features:

REPORTS OF STATE COMMISSIONS.

Irrigation commissions have been at work for a year in eighteen States and Territories collecting facts and opinions upon which to base recommendations for a national policy and code of common State laws. These commissions will have seats in the congress, and give that body the benefit of their knowledge and experience. It is already known that their reports will cover a wide variety of plans, ranging all the way from public to private control, and from national to State supervision. Those reports alone would furnish the basis for the most interesting congress ever assembled in the West.

AN IRRIGATION POLICY FOR THE NATION.

Men will come from all over the United States, from all trades and professions, and from all political parties

to contribute their share to the making of a national irrigation policy. It is hoped that this will be the final clash between land cessionists and anti-cessionists, and that a compromise can be arranged which will unite all factions. It is hoped that the outcome will be a bill, framed in definite terms, for presentation at Washington. The bill will probably be supported by a ringing address to the American people. If these results are accomplished the Denver Congress of 1894 will be historic.

PROBLEMS OF THE SEMI-ARID REGION.

This congress is most timely for the people of the semi-arid portions of the Mississippi valley, whose crops have been laid waste by recent hot winds. The congress will bring together the men best capable of dealing with the problems of the semi-arid region, and ought to result to the vast good of that section. The attendance from Kansas and Nebraska and western Texas is expected to be very large.

IRRIGATION EAST OF THE MISSISSIPPI.

This congress will mark the entrance of a new element into the domain of irrigation inquiry. Georgia has appointed an irrigation commission, consisting of five of her prominent citizens, and promises a delegation of fifty to one hundred delegates. Florida will also send a commission. The governors of eastern States are naming delegates very generally, and it is probable that immense interest in the possibilities of eastern irrigation will result from the debate under this head of the programme.

OPENING THE LAND OF THE UINTAHS.

BY J. M. GOODWIN, OF THE "SALT LAKE TRIBUNE."

GREAT interest is centered in the Uintah and Uncompahgre Indian reservations located in the northeastern corner of Utah. This interest is fully warranted in the excellent quality of the country, its climate and varied resources. Now that these lands are to be thrown open to settlement by whites the interest in the country has greatly increased until there promises to be a grand rush of prospective settlers as soon as the bars are let down and the thousands are permitted to enter and make filings on agricultural lands and mining claims. Persons who have traveled all over the Rocky mountain region and become familiar with resources of the country pronounce this the best of all. As an Indian reservation the country has been closed against intrusion of prospectors for minerals and there were no reasons for the entrance of home-seekers while these lands were held by the Indians, and yet many men have been quietly watching the country in hopes that the time was not far off when they would be permitted to enter and make homes there.

CONGRESSMAN RAWLIN'S WORK.

Utah is fortunate in having Delegate Rawlins in Congress and to him belongs the credit of having pushed forward the measures which will soon open this great country to settlement, and which will in time make a magnificent and prosperous mountain-locked empire. The opening of these reservations has been the subject of discussion for years, and now that it is about accomplished the public wish to know what the country is like, its attractions, resources and how to best reach there.

"It is the garden spot and treasure vault of Utah," says one who has traveled and explored nearly every nook and corner of this great Territory. He is by no means alone in his praise of these reservation lands.

AREA.

The two reservations combined contain an area of 6,207 square miles, or 3,972,480 acres, the Uintah containing 3,186 square miles, or 2,039,040 acres and the Uncompahgre 3,021 square miles, or 1,933,440 acres. This vast tract of country has been held by 2,000 Indians. In parceling the land to them the head of each family will receive 320 acres and the other members of the family 160 acres each. Counting five in each family will give about 384,000 acres to supply the Indians, leaving 3,598,480 acres for white settlers. It is estimated that about sixty per cent. of these

lands are suitable for agricultural or grazing purposes. This will be ample for a population of forty to fifty thousand people. Under the favorable conditions already foreshadowed these figures on population are likely to be realized in the not far remote future. The country is so picturesque as to charm the lover of nature and the artist, while to the sportsman there are few, if any, more enticing fields, game being so abundant amid the fastnesses of the mountains and their dense forests.

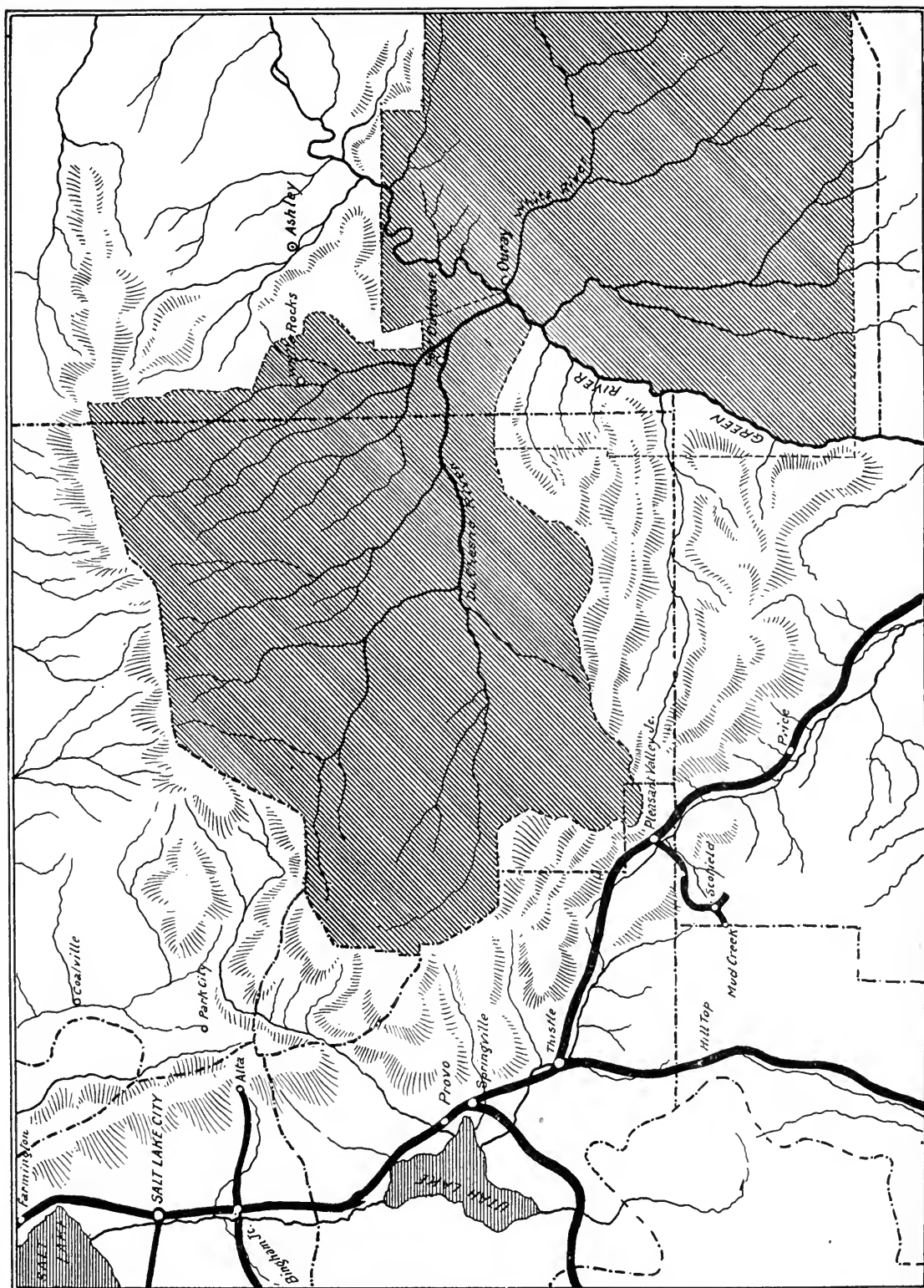
BOUNDARIES.

These two reservations are bounded on the north by the Uintah range of mountains; on the west and south by the Wasatch mountains; on the south and southeast by the Book Cliff range and on the east by the White River range. To reach this vast valley, entrance must be made through some of the passes. The Wasatch mountains comprise the great range which passes from south to north through all of Utah and into Wyoming and Idaho. The Uintah range has an east and west trend, its western end joining onto the Wasatch range at right angles. These mountains rise to an elevation of over ten thousand feet in one peak, are densely timbered and difficult to cross. The Book Cliff and White River mountains are not so rugged and less attractive.

As an outfitting and starting point from which to reach this country, Salt Lake City is superior to all others. It is only seventy miles from Salt Lake City, over good roads in a southeasterly direction via Park City, Helm City and Daniels Pass to the western end of these reservations. To that point the road is good with no very heavy grades. From there onward down Strawberry valley the road is fair and much as nature made it.

A FERTILE VALLEY.

Strawberry valley was so named from the abundance of wild berries found there. It embraces a country thirty miles long and twenty miles wide—in its valley and table lands—which is covered with most nutritious grasses and is known by all stock men as the most beautiful and best grazing lands of all the West. It has supported great herds of stock each season for several years past. Its elevation and proximity to the mountains make it a cool place in summer. Frost forms there early in September and remains till May, and the fall of snow is but little greater than in Salt Lake valley. The soil is so fertile



UINTAH AND UNCOMPAGRE INDIAN RESERVATIONS, IN UTAH, ABOUT TO BE OPENED TO SETTLEMENT UNDER THE RAWLIN'S BILL.

that it produces excellent potatoes and other root crops and immense yields of barley, wheat, etc. Strawberry creek empties into the Duchesne river and finds its way to Green river.

ABUNDANT WATER.

The entire Uintah reservation is a basin, having such a system of rivers and creeks running toward a central point to the entrance of the Duchesne into Green river as to make a map of it resemble a palm fan with its main stem or handle and dozens of ribs branching off in various directions. These streams are all formed in the high mountains, are fed by melting snows and springs, and are never failing, and carry abundant water to irrigate all the arable lands of the valley, including the mesas, which are as good as any. The mesas, or uplands, produce excellent and abundant crops of wheat, barley, oats and grasses. Around the agencies the Indians raise all the fruits of the temperate zone.

The elevation of the valley is some higher than that of Salt Lake Valley, but the climate is about the same. Salt Lake Valley has a national reputation for fine fruit, and the valley of the Green and Duchesne are destined to win similar laurels. The Indians around the agencies cultivate in all some six or eight thousand acres of land, both bottom and upland, with fine results. Wild fruits grow luxuriantly all over the reservations.

Besides the streams already named, the great Green river runs through the eastern end of the reservations from north to south, while White river and other streams come in from the east and empty into the Green. All these streams, besides being never failing, have ample fall, with good dam and reservoir sites enough to make extensive systems of irrigation both easy and comparatively inexpensive. It will be a good field for irrigation enterprise and capital to operate.

AS A MINING COUNTRY.

But great as is the agricultural and stock raising resources of this reservation country, to the mining men it promises even greater inducements to enter within its borders. The Uintah, the Wasatch and White River mountains, all contain minerals. Years ago a copper mine was opened in the Uintah mountains and mined until it got into litigation, and it paid well, even after a cost of \$40 per ton for hauling to the railway in Wyoming, a distance of 125 miles. This, of course, was outside the reservations. Lately prospectors have been scouring the hills within the reservations limits, and gold, silver, lead and copper have been found, and just as soon as the reservations are thrown open there will be a rush to put up stakes and file on claims now known and others to be uncovered.

ASPHALTUM.

Several years ago some Salt Lake men found a vein of pure asphaltum just within the limits of the Uintah reservation. It was of so great value as to induce them to purchase the land of the Indians and get Congress to ratify this by the passage of an act changing the line so as to place the mineral outside. Since then the Gilsonite Mining Company has shipped thousands of tons of "Gilsonite"—the name given to the substance—to points east for manufacturing into lacquers, varnishes, etc. The vein is four feet thick, stands perpendicular and crops out for miles. Gilsonite and other forms of asphaltum are found over a large scope of this reservation country. There are extensive stretches of country covered with lime and sandstone, saturated with asphaltum, which will be useful in street paving, etc. This is near White Rock agency.

In no other place in the United States are carbons and hydrocarbons found in as great and varied forms as here. There are several extensive naphtha springs pouring out semi-liquid streams, while elaterite or mineral rubber abounds in places, and ozokerite or mineral wax is found in many places. It is said that the Indians have found small quantities of amber, and there are abundant signs of great quantities of petroleum existing on Green river southeast of White Rock agency.

Near the southern boundary of the reservation there is an abundance of lignite, of epsom salts and other mineral salts found along many tributaries of Green river, and these exist in such great quantities as to promise magnificent returns in commerce as soon as railway communication is made direct with the country.

TIMBER AND STONE.

Building stone of white, gray and red sandstones is simply inexhaustible in quantity and of superior quality. There is also great wealth in store in the forests covering the mountains. White and yellow pine, cedar and fir trees seventy-five to one hundred feet high and two and a-half to four feet diameter are very common, while smaller trees afford abundant supplies of railroad ties, poles and posts for fences, etc. In the valleys along the streams are aspen, willow and cottonwood, a good source of supply and profit to the homemaker.

A SPORTSMAN'S PARADISE.

The writer, some three years ago, saw a shipment of nearly three thousand deer skins to a merchant in Salt Lake. These the Indians had made into dressed skins after having slaughtered the animals, chiefly for the hides, which brought them only a few cents each. This incident is mentioned to convey some idea how prolific deer grow in that country, even while this in-

discriminate slaughter goes on year by year by these Indians. In the Uintah, White and other mountains in and around this reservation are more deer, bear, antelope, mountain lions, pine and sage hens, grouse, etc., than in any other locality in Utah; hence it is a delightful resort for the hunter in search of small or large game. And if fishing is desired, the streams—all of them—are so well stocked with trout, etc., as to afford fine sport and large catches.

RAILROADS—PRESENT AND PROSPECTIVE.

From Salt Lake City to Park City the Utah Central railway has been operating for several years. It is being greatly improved and the company propose pushing it ahead into and through these reservations and on to connections with Denver. It promises to be the first road to tap the country. It has the route graded from Park City to Moon's Mills, a distance of twenty-five miles, and much of the material requisite is on hand. It is a splendid route for a railroad, having easy grades, while the requisite timber is available in the Uintah mountains, which the road would cross. It is 178 miles by this route to the Colorado line, the farthest point east of the reservations. This is a route destined to be the short line between Salt Lake and Denver, and the Utah Central, having made the start, promises to be the first to enter this new domain, and it will reap a rich harvest from the traffic which is sure to come to it.

AN OBJECT LESSON.

Ashley Valley lies a little east and north of that portion of the reservation about White Rocks, and is separated from it by some table or mesa land. Ashley Valley was settled a number of years ago by a people so far removed from the outside as to remain at home almost permanently, and having no market for their products except in driving their stock from one to two hundred miles to the railway or else hauling their wool and other articles a like distance to a shipping point. And yet they have been a prosperous people, have raised good crops of grains, vegetables and some fruits, and are well contented with their country and homes. Theirs is called one of the best and most prosperous valleys in the State of Utah, and the opening of the reservations is going to work great benefit to them, while the building of a railroad

there will give them greater energy, bring renewed prosperity and greatly change the aspect of their country.

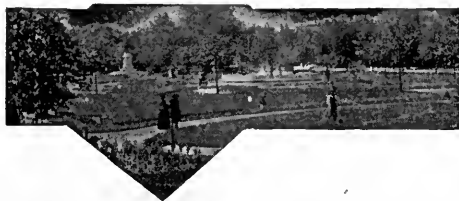
The towns of Ashley, Vernal and Jensen, now small places, will become lively towns soon, because of the changes to be wrought in removing the reservations boundaries. Ashley Valley, where cultivated, affords an excellent object lesson of what changes may be wrought through cultivation and irrigation of desert lands. It is now a genuine garden spot, and shows what most of these reservation lands may be changed to by the same means employed here.

THE VARIOUS ROUTES.

Salt Lake City has been mentioned as the best outfitting and starting point for this new domain. Everything desirable can be secured in this city, and if persons wish to drive through by team the route by Strawberry Valley will be found easy, pleasant and most desirable of all, and the shortest. If one wishes to go part way by rail, Price station, on the Rio Grande Western Railway, 125 miles east of Salt Lake, is the next best route. From there it is 120 miles to White Rocks agency, and about ninety miles to Fort Duchesne. This is over a road prepared for the military and agencies, and besides being hilly has much sand and dust to contend with. The routes from Rock Springs, Green River and Carter stations on the Union Pacific, in Wyoming, are longer and more difficult than either of those mentioned.

THE PROSPECTIVE SETTLER.

To Utah the opening of these reservations to settlement means a great deal. To many people outside of the State it offers opportunities for making for themselves homes, to engage in farming or stock raising, while many will make haste to enter its canyons and scale its mountains in search of precious metals. The sawmill man will find there a rich harvest in the magnificent timber just as soon as the country demands lumber, and there will be such varied opportunities for employment and business that the rush for places will be much like the incidents of the opening of the Oklahoma country, while this new domain has more inducements to offer the newcomers than any others had to bestow.



THE UNOCCUPIED LANDS OF COLORADO.

THE CENTENNIAL STATE STUDIED AS A FIELD FOR FUTURE HOME-MAKERS.

BY J. A. BRECKONS.

THE presence of the official representatives of the irrigation sentiment of the United States in Colorado during the first half of the month of September renders timely a discussion of the home-making opportunities in the Centennial State. If the hopes of the champions of our new industrial life are to be realized anywhere, then Colorado will certainly have her share of the new developments. She ranks second only to California in the number of acres now under ditch, and in the number of people earning their living upon irrigated lands. She has contributed her share to the literature, customs, judicial decisions and practical examples of reclamation that make up the fabric of the irrigation industry as it exists to day. And although her fame has rested hitherto rather upon her mines and silver kings than upon her agriculture, the products of her soil have long ranked above her mineral output in annual value, and the time appears to have come when her water and land resources arouse the enthusiasm among her own people which they so amply justify. The mines of Colorado will continue to be developed, and are as

yet scarcely touched, in a comparative sense, but the most interesting page of her future history will deal with the gardens and orchards, the fields and farms to be wrought out by human industry on deserts now voiceless, by men who seek independence and prosperity through the cultivation of the soil.

During the past six weeks the writer has made a careful personal study of the newer portions of the state. He has traveled hundreds of miles by train, by carriage and on horseback, and has sought to make the personal acquaintance of the subject with which he deals. He was asked to look at everything from the standpoint of the home builder and to give the readers of THE IRRIGATION AGE truthful pictures of the opportunities which exist in this direction. The older agricultural district of Colorado, which includes such well-known communities as Greeley, Fort Collins, Longmont, Boulder and others, has often been described in these pages and held up as an example to progress elsewhere. This article deals designedly with the newer fields in the imperial state of Colorado.

I.—IN THE VALLEY OF THE GRAND.

Had Rasselas, when he went in search of the happy valley, turned his footsteps in the direction of Grand Valley, on the western slope of the Rockies, his quest for happiness would not have been in vain. For in no other spot can be found a more complete combination of the essentials for ideal and happy homes or a perfect community. Soil, water, climate, location; all conspire to make it a region which needs but the magical touch of intelligent human effort to make it one of the delectable places of earth.

CHARACTER OF SOIL AND PRODUCTS.

The soil is a rich sandy loam of great depth, highly saturated with mineral salts, and adapted to all the varieties of grain, grasses, vegetables and fruits. Although general farming is profitable the success which has been attained in fruit growing and the great profit fruit culture brings to the intelligent horticulturist has made it the leading industry of the valley, and of the 35,000 acres under ditch fully 10,000 acres are planted in orchards. Additional acreage is being planted in orchards each year, and fully 3,000 acres will be set out in fruit next season.

Apples, pears, apricots, prunes, grapes and all small fruits are grown with success, but the reputation

of Grand Valley has been mainly made by its peach crop, which both in early and late varieties surpasses in quantity and quality that of any other locality in the State.

As the net profit on an acre of fruit in full bearing is about \$300 per annum, it can readily be seen that with its rapidly increasing fruit acreage Grand Valley is destined to be one of the most wealthy and prosperous communities in the west.

EXTENT AND DEVELOPMENT.

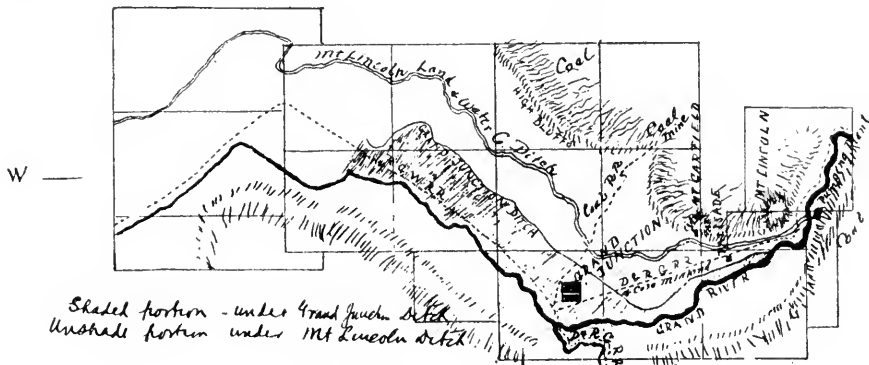
The valley contains 150,000 acres susceptible of irrigation and cultivation. Of this 35,000 acres are now under ditch and enterprises are perfected and being put into operation for putting the entire valley under ditch. Although much of the land now irrigated is under gravity ditches, yet it has been found profitable, so productive is the land, to irrigate large bodies of land by pumping plants, the power for which is furnished by turbine wheels operated by the volume of water in the Grand river, which has a heavy fall through the valley and affords ample water power for running the largest pumping plants. Nearly all of the enterprises now contemplated for increasing the acreage of irrigated land will employ these means.

QUANTITY OF WATER.

In almost every irrigated district in the west the cry is heard: "If we only had more water!" It is never heard in Grand Valley. There is water in abundance to irrigate every foot of land in the valley and have enough left to irrigate twice as much more. This immense quantity of water is supplied by the Grand and Gunnison rivers, the former of which carries 12,000 cubic feet of water per second where it enters the valley, and the latter 6,000 cubic feet per second. Besides these are Plateau and Rapid creeks, tributary to the valley, their waters aggregating 500 cubic feet per second. These rivers and creeks are fed by the perpetual snows of the mountains and will pour down their vast volumes of water for all time.

CLIMATE.

As a health resort Grand Valley has an enviable record. The altitude is sufficiently great, 4,000 to 4,500 feet, to ensure a light and dry atmosphere, while the mountains that protect the valley on all sides so modify the winters that they are such only in name.



THE VALLEY OF THE GRAND.

The mean temperature of the six coldest months of the year is about thirty-nine degrees above zero; the mean temperature for the six summer months will average sixty-eight degrees. Particularly is the climate adapted to those who are suffering from lung diseases, or for catarrhs affecting any of the mucous membranes or glands. Many of the cases of bronchitis, catarrh, asthma and consumption, pronounced helpless in the east, and which are indeed so there, are capable of recovery here.

NEARNESS TO MARKET.

The Grand Valley fruit growers possess an immense advantage over all competitors in their nearness to market. Peaches picked late in the afternoon are on sale on the Denver fruit stands early the next morning, while Leadville, Aspen, Pueblo, Gunnison, Colorado Springs—in fact, all of the mining camps, manufacturing cities and resorts of Colorado—are

but a few hours distant. Three railroads, the Colorado Midland, the Denver and Rio Grande broad gauge and the Denver and Rio Grande narrow gauge, connect the valley with its markets. There is no farm in the valley over six miles from a railroad station, from which shipments may be made by freight or express and every facility the roads can offer is afforded the fruit grower and farmer.

COAL, COKE AND NATURAL GAS.

The mountains on both the north and south sides of the valley contain two veins, one eight feet and one four feet thick, of excellent coal. These veins are mined at the Mt. Lincoln and Little Book Cliff mines, the latter connected with Grand Junction by a narrow gauge railroad twelve miles long. Coal is sold at the mines at \$1.25 a ton.

A good grade of coke is made from the coal and coke ovens are operated during the winter season.

Natural gas has recently been discovered within the city limits of Grand Junction. Borings to demonstrate its extent are being made.

SCENERY AND SURROUNDINGS.

The Grand Canyon, through which Grand Valley is reached from the east, is awe-inspiring in grandeur, being one of the most picturesque and beautiful canyons in Colorado. Its precipitous walls rise thousands of feet above its floor, where the Grand river tosses and fumes in a roaring torrent over rapids and falls as if constantly fretting at the encroachment of the railroad which crowds it into smaller proportions than even the narrow bed given it by nature.

The high walls of the canyon widen out to form Grand Valley and form picturesque barriers to the north and south not only guarding it from the severity of storms but affording inspiring views of timbered mountain ridges and rocky summits piercing the clouds and apparently combining with the heavens to shut the valley in from the troubles of the outside world.

PRICES OF LANDS.

Unimproved lands in the valley are held at an average price of from \$50 to \$60 an acre, including water rights. Improved farms, with orchards from two to three years old, may be bought from \$250 to \$400 an acre. Owners of full bearing orchards will scarcely part with them at any price, for they afford a certain, unfailing revenue which, considering the capital invested and small amount of work required, cannot be excelled in certainty or amount by any other industry or investment.

These prices may at first blush look high, but compared with California, Idaho or Washington prices they are reasonable and when nearness of market, abundance of water and certainty of crops are considered they are remarkably low.

They will not, however, remain at such reasonable figures very long. Plans for putting every acre of its area under ditch and for colonizing its rich lands are under way, and soon its lands will be a prize hard to secure and values will rise accordingly. The homeseeker who is looking for the location where the most favorable conditions for a happy existence may be found should look in the direction of Grand Valley at once.

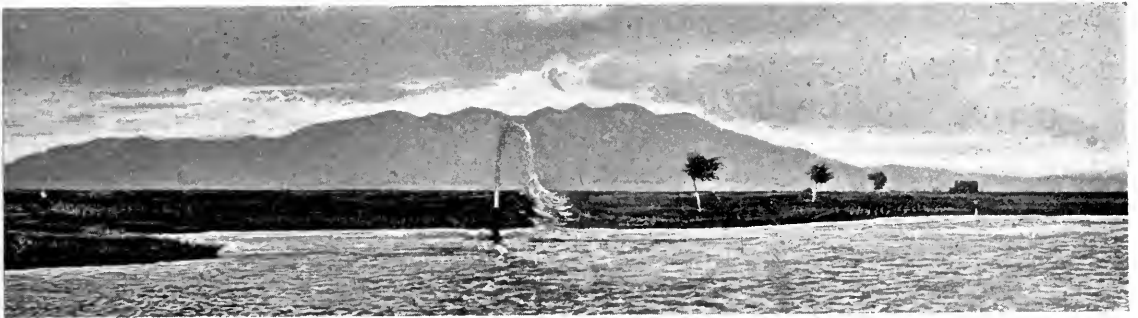
5,000 to 7,000 feet above the level of the valley which has an average altitude of 7,200 feet above the sea level. The continental divide shelters it on the west and north and the Sangre de Cristo range on the east. Mount Blanco, 14,000 feet high, towers in the eastern range like an immense sentinel of the range.

WELL WATERED.

The Rio Grande river enters the valley midway on the west side breaking through the sheltering range of mountains at Wagon Wheel Gap. It flows eastward to the center of the valley and then southward, making its exit through a deep gorge which it has cut through the Conejos range on the southern limit of the valley, into New Mexico. A number of creeks water the northern portion of the valley, all uniting in the San Luis river which flows into a chain of lakes, the San Luis lakes near the center of the valley and from which there is no visible outlet. In the southern part of the valley the surrounding mountain ranges are drained by the Alamosa, La Jara, Conejos and San Antonio rivers, all emptying into the Rio Grande.

ARTESIAN WELLS.

Besides its water supply from creeks and rivers the entire valley is underlaid by an immense body of



ARTESIAN WELL IN THE SAN LUIS VALLEY.

II.—THE GREAT SAN LUIS VALLEY.

Just at the present time when drouths and simoons have demonstrated that farming in portions of Kansas, Nebraska, Missouri, Iowa and Illinois is a game of chance with great odds against the farmer, the eyes of hundreds who are looking for a new field in which to begin anew are turned towards the great San Luis valley, and scores of visitors from the burnt-up districts of the Mississippi valley are visiting San Luis to "spy out the land" for themselves and friends.

ITS EXTENT.

The San Luis valley is a great plateau of almost level land 125 miles long from north to south and averaging 50 miles wide from east to west. It is entirely enclosed by mountain ranges which are from

water which is tapped by over 3,000 flowing artesian wells varying in depth from 100 to 1,000 feet and in capacity from 25,000 to 900,000 gallons per day. The pressure is such that the water is carried from these wells through the highest buildings in the valley and the flow is such that considerable land is irrigated from them. At Alamosa the entire townsite of 640 acres is irrigated by two artesian wells. Although many of the wells in the valley have been flowing for several years the supply does not diminish, but continues the same in all seasons. The cost of putting down these wells is small, not exceeding 20 cents per foot.

Besides the immense body of water forming the supply for artesian wells, water is to be found in surface wells by digging twelve to fifteen feet. The

supply of water found in this way is apparently inexhaustible and ordinary windmill pumping machinery cannot pump them dry.

CHARACTER OF THE SOIL.

At some remote period the San Luis valley was undoubtedly a great mountain lake, the mountain ranges now bordering the valley forming its shores. The soil which once formed the bottom of the lake and now forms the valley lands is from ten feet in depth in some places to hundreds of feet in others and was made by sedimentary erosions carried down from the surrounding mountain ranges.

The soil in consequence contains mineral as well as organic matter and is practically inexhaustible. In many portions of the valley the soil contains a mixture of volcanic ash which makes it admirably adapted for the cultivation of small fruits.

IRRIGATION IN THE VALLEY.

The San Luis valley is admirably adapted for irrigation. It is a smooth plain sloping from either side to the center of the valley at an average grade of about ten feet to the mile, and from the north to the south at a lighter average slope, admitting of easy irrigating. The character of the soil and the almost absolute freedom from arroyos or breaks make ditch building comparatively inexpensive so that perpetual water rights in this valley cost the farmer very little more than annual charges for water in many sections of the country. Although along the river bottoms many farmers irrigate from individual ditches the bulk of the land now under ditch is covered by large ditch enterprises.

Among the larger enterprises of this character in the valley are the Rio Grande Land and Canal Company which has over 100,000 acres under ditch. This company has two canals taken from the Rio Grande between the town of Monte Vista and Del Norte aggregating seventy-five miles in length with several hundred miles of laterals.

Near Alamosa the Alamosa Land and Canal Company has 100 miles of canals with over 70,000 acres under ditch. The Empire Canal Company also has a large canal system under which is 70,000 acres.

At Antonito in the southern part of the valley the Toltec Canal Company has an immense storage and canal system by which the waters of the Conchos and San Antonio rivers are impounded and 545,000,000 cubic feet of water stored annually for purposes of irrigation.

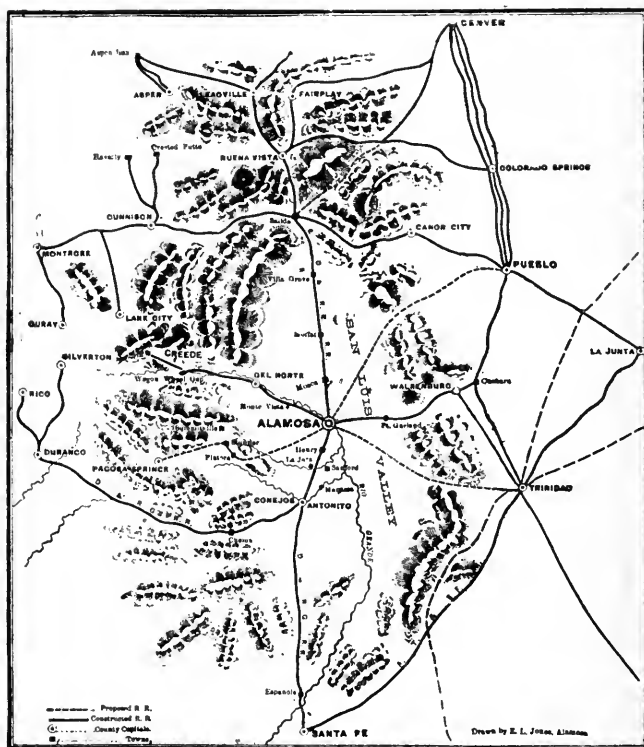
SUB-IRRIGATION.

Natural sub-irrigation is rapidly increasing the acreage of farming land in the val-

ley. Sub-irrigation is the process by which non-irrigated lands lying between or contiguous to irrigated lands become productive and arable without direct irrigation. A 40 acre tract without irrigation if located between tracts of irrigated land, or if contiguous to a large body of irrigated land for several years, becomes productive and may be farmed profitably without direct irrigation. The soil and sub-soil of the San Luis valley are peculiarly adapted to sub-irrigation and large areas are yearly being added to the arable acreage by this method.

INCREASING DUTY OF WATER.

From the same conditions the duty of water is constantly increasing and with each succeeding year the farmer finds he needs less water for his land, or that with the same amount of water he can cultivate more land. The increasing duty of water and the increasing acreage by sub-irrigation are dispelling the idea that large reservoir systems must be established along the Rio Grande at the head of the valley in order to increase the area of farm land in the valley. It is probable that the immense acreage of the valley will eventually be farmed and cultivated with no additional water facilities, except the extension of canals and laterals, than it now has in its canals, artesian wells and surface wells.



SAN LUIS VALLEY.

CROPS RAISED.

All kinds of small grains, potatoes, field peas and all garden vegetables and small fruits grow to perfection. The soil and climate seem especially adapted to wheat, oats and barley. Wheat yields from 25 to 45 bushels per acre, oats from 40 to 90 bushels and barley from 30 to 75 bushels. The average yield of the valley this year will be 25 bushels of wheat per acre, 40 bushels of oats and 35 of barley. Potatoes yield heavily. One hundred and fifty bushels to the acre is a small yield, and 200 to 400 bushels are generally raised. An acre grown in competition for the prize of \$500 offered by the *American Agriculturist* produced 50,582 pounds, or 847 bushels. Alfalfa has proven a great success. It is the staple crop on farms where hog, sheep and cattle raising is combined with farming. Field peas take the place of corn, which is raised to but a limited extent. The yield is from 20 to 35 bushels per acre. For fattening

mountains surrounding the valley are covered with large forests of pine, cedar and other woods, furnishing fuel, fence posts, logs for building, etc., free for the taking.

MARKETS.

The San Luis valley is surrounded by a mining and manufacturing region and has a market for its products at its doors. The valley has excellent railway facilities, being traversed from north to south by the main line of the Denver & Rio Grande railway from Denver to Durango, with branches diverging southward to Santa Fé, N. M., eastward to Pueblo and westward to Creede. There are five flouring mills in the valley, that at Alamosa being of 300 barrel capacity per day. The valley is within short shipping distance of all the principal mining towns of the state and finds in them a constant market for its products. The liberality of the Denver & Rio Grande railway provides an export freight from the valley to Denver



A HAY FARM ON THE ANIMAS.

purposes they are superior to corn, $3\frac{1}{2}$ bushels of peas being considered equal to 5 bushels of corn. The pea is a valuable rotation crop, as large crops of grain are grown after peas as if the land had lain fallow for the season. With alfalfa and peas hogs are raised as successfully and cheaply in the San Luis valley as anywhere, and with better markets and perfect immunity from cholera.

FREE RANGE, FREE TIMBER.

In the foothills, parks, canyons and valleys of the mountains surrounding the valley is free range for vast numbers of cattle and sheep. Farmers club together and employ a herder for their united herds during the grazing season, wintering their stock on straw and farm pastures, the grass of which, allowed to cure on the ground, makes fine winter feed. The

and Pueblo which enables the San Luis producer to defy competition from the states to the east.

CLIMATE.

The climate, in common with that of the Rocky Mountain region, is salubrious. In summer, warm days and cool nights and in winter clear, cool weather, tempered by the great mountains which overlook and surround the valley and protect it from the blizzards and tornadoes which are the dreaded features of the plains country.

SOCIAL CONDITIONS.

Hospitality and good feeling will be found to be the characteristics of the farmers who have already settled in the San Luis valley. Although essentially a farming region it has a number of pretty towns within its borders. Alamosa, the leading town, is the railroad center of the valley. Monte Vista, Del Norte,

Antonito, La Jara and Mosca are progressive towns with enterprising citizens, good schools, churches, large business establishments and handsome residences. All of the towns of the valley show a healthy growth with no evidences of the pernicious effects of real estate booms.

BIG AND LITTLE FARMS.

Although large farms are as a rule unprofitable the experiment has been tried with success in the San Luis valley upon the lands of the Colorado Valley Land Co., near Monte Vista. On the north farm of the company 7,640 acres are in profitable cultivation. One thousand hogs and 1,000 steers are being fattened on the farm this summer on alfalfa and peas. The La Garita farm has 2,000 acres in cultivation, 250 acres in alfalfa, 1,000 acres in grain, the rest in hay. The Meadow farm has 6,000 acres all devoted to hay and stock raising. The Central farm, 2,560 acres, is devoted to grain raising. Although these farms are successful the most profitable farming is found to be on the small tracts of from 40 to 80 acres.

Forty acres is enough land for the farmer of ordinary means and help. Besides the certainty of return, the yield, under proper irrigation, will average far more than the 160 acre farms in the Mississippi and Missouri valleys and the outlay for machinery, farming stock, purchase money, etc., is proportionately less. Many tracts of this size have been fenced by the canal and land companies, have artesian wells on them, houses and barns erected and are ready for the purchaser to begin farming.

PRICES AND TERMS.

Prices of lands in the San Luis valley are exceedingly moderate and terms of payment are exceptionally easy. Improved lands with fences, ditches, buildings and other improvements are offered by the various land and canal companies at prices varying from \$10 to \$20 per acre including perpetual water right. Terms are usually 20 per cent. cash, the remainder in long time annual payments with 6 per cent. interest.

INSURANCE AGAINST DROUTH.

Agriculture in the San Luis valley has long since passed the experimental stage. Where there have been failures they have been due to lack of industry and intelligence on the part of those who have failed. Hundreds of well improved farms and prosperous farmers attest the fact that success is within reach of those who will work with hands and brain.

The soil is unrivalled in fertility, the water supply is ample and crop failures are unknown. There is a perpetual insurance

against drouth and good, industrious farmers can raise abundant crops every year, and grow rich. Poor shiftless farmers fail here as they do everywhere.

III.—THE SUNNY WESTERN SLOPE COUNTY.

Montrose is one of the four counties formed from the old Ute reservation in 1881, the present county organization having been made in 1883. The Indian, an unerring guide in directing the advancement of civilization to the most bountiful regions of nature's domain, clung with tenacity to the valley of the Uncompahgre, and knowing he was being removed from the "garden spot of Colorado," gave up the land with reluctance.

The county has an area of 2,388 square miles. Under the present means of irrigation 200,000 acres may be classed as arable land, the remaining area being grazing and timber lands.

WATER SUPPLY.

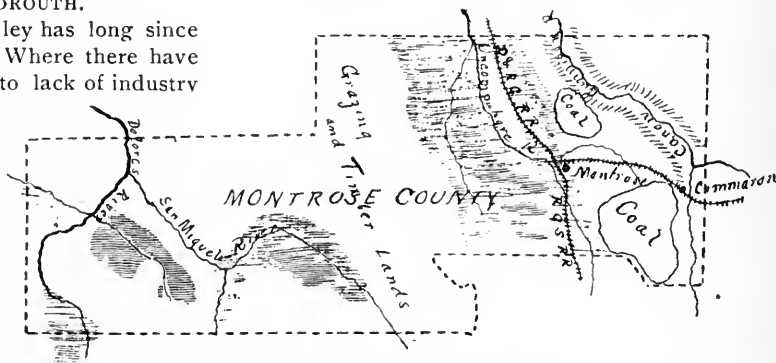
Montrose county is watered by the Gunnison river, which flows through the northeastern portion of the county; by the Uncompahgre, which flows across the county from south to north; by the San Miguel and Dolores, which flow through the western part of the county, and by numerous creeks tributary to these streams.

Several large ditch systems supply water to the Uncompahgre valley farmers, but a number of farms are watered by ditches owned by the farmers themselves. All the irrigating systems are supplied by gravity ditches.

Like Delta county, the irrigated area can be greatly increased by either national, state or individual enterprise, as the Gunnison river, with its immense and never-failing water supply, affords an opportunity for placing large areas of mesa and high lands, now above ditch, under cultivation.

CHARACTER OF SOIL.

Along the river bottoms the soil is rich in silica the potashes and alkaline salts, especially adapted



SHADED PORTIONS SHOW IRRIGATED DISTRICTS.

for the cultivation of hay and potatoes. The second bottoms are generally of an adobe nature, with fertile soil of great depth, growing immense crops of grain. Between these lands and the foothills the soil is especially adapted for fruit growing. It is of volcanic formation, with high percentages of potash, phosphoric and sulphuric acids, and nearly seven per cent. of lime. The chemical action of these properties, under the influence of heat and water, is to give off free ammonia—the life of apple, peach and pear trees and all stone fruits. This potash, lime and soda account for the four and five pound potatoes, forty pound cabbages, and the magnificent pears, apples and peaches which have made Montrose county notable in agricultural and fruit displays in Colorado State fairs.

GENERAL AGRICULTURE.

Montrose county is unexcelled for wheat, potatoes, alfalfa and oats, and produces corn, barley, rye, sweet potatoes, sugar beets and cultivated grasses in profitable quantities. Wheat averages thirty-five bushels per acre and produces a never-failing crop. Three crops of alfalfa are produced, averaging four to five tons per acre annually. The immense stock interests of the county afford an unfailing market for alfalfa, for use as winter and spring feed for fattening range stock for market. Two flour mills in Montrose consume all the wheat grown in the county without filling the demand for flour. The closeness of the mining towns of Ouray, Telluride, Rico, Leadville, Gunnison and Aspen afford continuous markets for vegetables and agricultural products of all kinds. Hog raising on alfalfa and grain has been found to be extremely profitable, and many farmers are engaging in the industry.

FRUIT GROWING.

Fruit growing in Montrose county may be said to be just commencing. It took actual demonstration on the part of several pioneer orchardists to convince the Montrose farmers that they were in one of the finest fruit growing belts in the West. There are several orchards from six to eight years old which will compare with any in Colorado or California for quality or quantity of production, but the average age of Montrose county orchards may be said to be three years. At the present time about 4,000 acres are planted in fruit. This area is increasing at the rate of 1,000 acres a year. Apples, pears, plums and grapes are found to be the best and most reliable varieties of fruit. Peaches excel in size and quality any grown in the State, but owing to occasional late frosts are not as reliable a crop as the hardier varieties of fruits. Small fruits, raspberries, gooseberries, blackberries, currants and strawberries grow in profusion and find ready sale at good prices in the mining town markets of the western slope.

CLIMATE.

Excessive cold in winter or heat in summer is unknown. There are no oppressive nights. The altitude of the farming lands, which is from 4,500 to 6,000 feet, precludes malaria, chills or epidemic diseases. For those affected with consumption, asthma or kindred troubles the climate is unrivalled. There is less zero weather in Montrose and more sunshine than in any State east of the Rockies.

MINING AND STOCK INTERESTS.

Coal, both bituminous and anthracite, is found in veins of from two to forty feet in thickness within a few miles of Montrose, the county seat. Gypsum, lime and white and cream colored sandstone, valuable for building purposes, are also close at hand.

Placer mining has been for years an industry on the San Miguel in the western part of the county. Rich gold quartz mines of free milling ore are now being opened in the northwestern part of the county, in the Goose creek mining district.

The live stock interests of Montrose county form one of its greatest industries. The ranges both for winter and summer grazing are well watered, and afford ample pasturage for large herds of cattle and flocks of sheep. A number of cattle growers combine farming on a large scale with stock raising—a profitable undertaking.

PRICES OF LANDS.

Unimproved lands under ditch may be had in Montrose county at from \$8 to \$20 per acre. Perpetual water rights are \$10 per acre with small annual charges for ditch maintenance. Improved lands with two year old orchards sell at from \$100 to \$300 per acre. Fifteen per cent. of the lands now under ditch may be taken up under the government land laws.

INCREASING THE WATER SUPPLY.

Should state or national aid be received to utilize the waters of the Gunnison the acreage of arable lands of the county may be doubled. Although the present water supply, if judiciously used, suffices for the lands now under cultivation it should be augmented by the construction of storage reservoirs, for which there are many admirable sites. The county is an excellent field for national or state outlay for construction of reservoirs and irrigation systems of large capacity. The acreage of arable land could, with national or state aid, be more than doubled, besides securing to the present irrigated districts an ample supply of water during the driest seasons. With its farming lands and waters fully utilized, Montrose county would support an immense population of prosperous people.

IV.—VALLEY OF THE GUNNISON AND UNCOMPAHGRE.

Forming part of the valleys of the Gunnison and Uncompahgre rivers of the western slope of Colorado is Delta county, a rich agricultural and fruit growing region. The county was originally part of the Uncompahgre Indian reservation and has only been the abode of the white man for about twelve years.

LOCATION AND EXTENT.

The county lies almost entirely in a basin, with ranges of mountains averaging 10,000 feet high on all sides except to the west. The county averages about forty-eight miles in length from east to west, thirty-six miles in width from north to south and contains 752,640 acres, of which about 32,000 acres are bottom lands, 268,500 acres stock range, 100,000 acres timber and 112,000 desert lands.

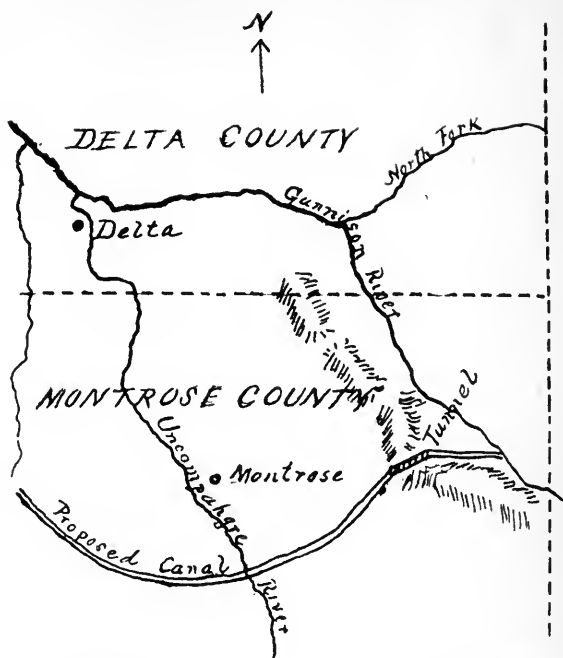
CHARACTER OF SOIL.

While the soils vary in productiveness they are, for the greater part, of alluvial matter mixed with mineral elements of peculiar fertility. For centuries these lands were being formed gradually from deposits of disintegrated granite and calcareous rock mingled with potash, lava and volcanic ash. In this soil are found all the elements which have made the grape and peach growing districts about the foot of Mt. Vesuvius, Italy, the wine producing areas of the Danube in Germany, and the Kern valley in California so famous. The soil is deep, mellow and easily worked. The bottom lands are a dark sandy loam, impregnated with vegetable mold and the silicates held in solution and carried down by the mountain streams. They are usually devoted to vegetable culture and gardening and to the growth of apples, pears and plums. The second bottoms, or lower mesas are largely made up of volcanic ash scoriæ and are rich in the potashes and sulphates of lime, elements so necessary to fruit culture. On these the peach, apricot and prune have yielded large and un-failing crops of exquisite flavor.

AGRICULTURE AND LIVE STOCK.

Agriculture and stock raising are carried on in Delta county without encroachment one upon the other. Cattle and horses are ranged on the immense open ranges along the mountain sides enclosing the county and are profitably fattened on alfalfa for market in the early spring.

There are in cultivation 3,000 acres of wheat, 2,000 acres of oats, 1,000 acres of corn, 1,000 acres of potatoes, besides smaller acreages of buckwheat, rye, timothy and clover. Of alfalfa there are 6,000 acres yielding 19,000 tons annually. There are 1,500 stands of bees, making 45,000 pounds of honey. The average crops are as follows: Alfalfa, three and one-fifth tons per acre; corn, twenty bushels per acre; oats,



PROPOSED TUNNEL AND CANAL TO RECLAIM 200,000 ACRES OF LAND IN DELTA AND MONTROSE COUNTIES.

thirty-two bushels per acre; wheat, eighteen bushels per acre.

WATER SUPPLY.

The Gunnison and Uncompahgre rivers and their tributaries form the water supply for irrigation purposes in the county. There are in the county 500 miles of irrigating ditches of which 200 miles are in ditches less than two miles each. There are completed thirty reservoirs covering 1,200 acres of land and storing 600,000,000 cubic feet of water; these are on the Grand mesa, overlooking the valley and lower mesa lands. The ditches in the county are almost entirely owned by the ranchmen, only two ditch companies selling water to the farmers.

RECLAMATION OF MORE LAND.

A project is now under way for the reclamation of an immense area of the best lands of the county now lying above ditch. Surveys are being made of the plan which is to take the waters of the Gunnison river by a tunnel through the range of hills, separating it from the Uncompahgre valley, and thence by large canals throughout the entire valley, from above Montrose to Delta, a distance of thirty miles. One hundred and eighty thousand acres of lands adapted for general agriculture and fruit raising would be reclaimed by the completion of this project, and ample water furnished to cultivate every acre of it. It is a project which might be carried to completion by state or national aid with great propriety as a great

portion of the land is subject to entry under the government land laws. Both Delta and Montrose counties would be the direct beneficiaries of the successful outcome of the enterprise.

CLIMATIC CONDITIONS.

In common with the entire western slope of the Rockies the climatic conditions prevailing in Delta county are particularly favorable to agriculture and horticulture. There are in the year about 200 days of sunshine, 60 partially cloudy days and only 45 cloudy days. Frosts do not appear until October. The growing season is therefore a long one, affording abundance of time for ripening of all cereals and fruits. Very little cold weather is experienced in the winter season; orchards are never damaged, the dryness of the atmosphere preventing injurious effects. Hailstorms are no menace in the well-protected valleys. The elevation of the principal agricultural and horticultural areas ranges from 4,800 to 5,600 feet.

FRUIT CULTURE.

The altitude, soil and climate of Delta county are peculiarly adapted to fruit growing and the acreage in fruit is growing rapidly. In 1893 thirty-five car loads of young trees were planted, while during the present year fifty-three car loads have been set out. There is no fruit grown in the temperate zone which does not flourish in these valleys. Apples, pears, peaches, grapes, quinces, apricots, plums, nectarines and smaller fruits are in bearing and there has never been a crop failure since fruit growing has been an industry in the county.

Of the six fruit prizes awarded Colorado at the World's Columbian Exhibition, Delta county has the honor of having secured four. The individual awards were:

No. 12,828, W. S. Coburn.....Stone Fruits.
No. 12,829, G. B. McGranathan.....Stone Fruits.
No. 12,830, Samuel Wade.....Apples and Pears.
No. 12,831, W. S. Coburn.....Apples and Pears.

Trees bear at from two to three years from planting, and full bearing orchards pay from \$100 to \$500 an acre per annum.

Prof. H. E. Van Deman in his report to the Department of Agriculture for 1893 says of the North Fork country in Delta county: "In all my travels I have not seen a more profitable or delightful place to grow fruit than the North Fork of the Gunnison river." As to the state of Colorado he says: "All things considered there is perhaps no state that offers greater inducements to the energetic and industrious, whether possessed of large or small means."

EXPERIMENTAL FARM.

During the past month a state experimental farm has been located in Delta county. Suitable buildings are being erected and the farm consisting of 40 acres of mesa land will be put under cultivation under

charge of an expert superintendent. The farm will be of inestimable value to agriculturists and horticulturists of the county.

PRICES OF LANDS.

Prices of unimproved Delta county lands range from \$15 to \$40 per acre, lands set in fruit from \$125 to \$250 per acre. Full bearing orchards are rarely in the market. Men with energy and a small capital can make a good profit from stock, hog raising, poultry, bees and market gardening while their fruit trees are growing. Markets are close at hand for everything that can be raised, in the mining towns of Ouray, Telluride, Rico, Lake City, Crested Butte, Aspen and Leadville.

V.—THE GREAT SOUTHWEST.

An empire in itself is southwestern Colorado. It is composed of the counties of Ouray, San Miguel, San Juan, Dolores, Montezuma, La Plata, Hinsdale, Archuleta, the western portion of Conejos and the southern Ute Reservation.

Within these counties are rich gold and silver mines; coal crops out from almost every hillside; there are immense tracts of pine timber; the entire region is abundantly watered by numerous rivers and countless creeks; the soil in the valleys and on the mesas, or table lands, is rich and productive; the climate is superb. Nature seems to have bestowed upon this chosen corner of the great State of Colorado every good gift in her command.

That these gifts of nature have, some of them at least, been appreciated in former ages is evident from finding traces in several places in the southwest of great cities of a prehistoric race. Near Marcos, in Montezuma county, the streets of a city may be traced and countless stone heaps may be seen in regular rows, telling mutely where once stood the habitations of man. These yield curious mementos of their former occupants to those who now take the trouble to dig a few feet below the surface. A few miles south along the canyon of the Marcos are countless evidences of the former existence of a skilled and cultivated race. For in the solid walls of the canyon are hewn palaces and temples and homes.

Nor are the gifts which nature has showered upon this favored region unappreciated by those who live in the present. But a dozen years ago the southwest was the home of the Indian, and to all, except a few explorers and gold hunters, it was a land unknown. Within a short time civilization and enterprise have built railroads over its highest mountain ridges; cities with all the conveniences of modern civilization have been erected within its borders; immense smelters are turning the ores from its many mines into the circulating mediums of the world's commerce; the waters of its creeks and rivers have been turned on to the thirsty lands, and farms and orchards now flourish in

what were but a short time ago barren wastes; the boundless belts of timber are yielding a share of their wealth to the demands of commerce; from the coal beds the black diamonds are being taken in scores of mines, and yet so little has been touched in any of these industries that scarcely a beginning has been made. There are still unexplored mountain sides to be prospected for gold and silver, unmeasured forests to be felled, coal areas unlimited to be mined, and millions of acres of land to be watered and cultivated.

OURAY COUNTY.

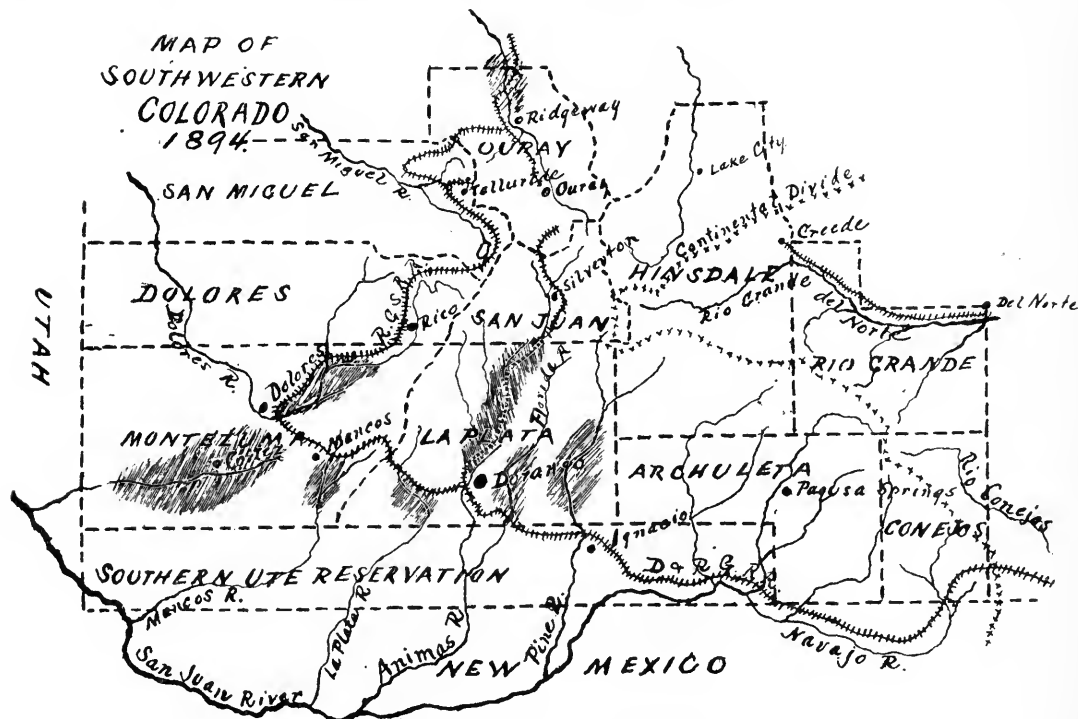
Ouray stands in the front rank of the mineral producing counties of Colorado. The well-known mining

SAN MIGUEL, DOLORES AND SAN JUAN.

Mining and lumbering are the leading industries of these three counties, the rich mines of Telluride, Ophir and Rico and the big lumbering camps of Dolores being within their borders. Although there is but little farming in these counties it could in the western portions of San Miguel and Dolores counties be made profitable. There are upward of 300,000 acres susceptible of reclamation and cultivation in Dolores and San Miguel counties, most of which is subject to homestead and desert entry. The mineral output from the three counties in 1893 was \$5,863,485.

HINSDALE AND RIO GRANDE

Are also mining counties, the output of gold and



SHADED PORTIONS SHOW IRRIGATED LANDS.

districts of Red Mountain, Iron-ton, Mount Sneffels and Ouray are within its borders. The mountains are covered with a heavy growth of timber. The county contains but one farming district, that at Ridgway, where several thousand acres are watered by the Uncompahgre and farmed with great profit. Owing to the great altitude alfalfa, grain and potatoes form the principal crops. The nearness to the markets of Ouray and other mining camps ensures top prices for everything produced and the Ridgway farmers are prosperous. The water supply is ample and the farmed area can be increased. The mineral output in 1893 of Ouray county was \$1,579,823.

silver constantly increasing from both. So eager is the search for the precious metals that agriculture is given but little attention, although a few valley ranches produce hay and vegetables at a good profit and agricultural development could be profitably extended.

MONTEZUMA COUNTY.

Montezuma county, in the extreme southwestern portion of the State, is one of the latest developed agricultural regions of Colorado, the past five years witnessing the first attempts to irrigate its lands in a systematic manner. Two large rivers, the Dolores and Marcos, supply the county with water.

Along the valley of the Dolores, from Montelores on the northern line of the county to Dolores Station on the line of the Rio Grande Southern, a distance of thirty miles, are numerous small farms, each with its own ditch system taken from the river. On these sheltered and well watered valley farms large crops of grain, alfalfa and vegetables are grown. The finest of timber is close at hand and coal may be had for the digging all along the valley. The Rio Grande Southern affords means of transportation to the mines of Rico, the lumber camps of Milltown or the markets of Durango.

A BIG SYSTEM.

At Dolores the mountains are pierced by a tunnel over a mile long into which a large volume of the river water is turned. A flume four miles long carries the water from the outlet of the tunnel to the table lands and mesas of the great Montezuma valley, placing 75,000 acres of choice farming and fruit lands under ditch. As there is too much water in the early part of the irrigating season and not enough for the cultivation of the entire area under ditch in the latter part, storage reservoirs are needed to make the system perfect. Excellent natural sites for storage reservoirs are to be found and the completion of the system, with storage reservoirs to afford an ample water supply for the driest season, may be looked for.

PLENTY OF ROOM.

As but 8,000 acres under this immense system are under cultivation the field offers abundant room for hundreds of families, who can find not only comfort but affluence on the rich Montezuma valley lands. Besides yielding large crops of grain, alfalfa and vegetables, apples, cherries, pears, apricots and peaches and all small fruits yield in abundance. Combined with stock raising, for which the free ranges and mild winters of the Montezuma valley offer excellent advantages, farming in this favored region may be made extremely profitable.

THE MARCOS VALLEY.

The Marcos valley, to the east of Montezuma valley, also affords a profitable field for the agriculturist. Irrigation is from the Marcos river, the farmers owning their own ditches. The system of a large number of small ditches is an extremely wasteful one, and while millions of gallons of water go to waste during the early part of the irrigating season there is a shortage for late irrigation. Coöperation on the part of the farmers is needed, either to put in reservoirs for storage or employ a large main canal in place of numerous small ones. The duty of water is but little understood and crops often suffer from too much water rather than too little.

The total acreage of Montezuma county under cultivation is 19,600 acres. The acreage of wheat in 1893 was 5,500, on which was raised 148,000 bushels; 500

acres of corn produced 20,000 bushels; 600 acres of oats produced 22,200 bushels; 6,700 acres of alfalfa produced 20,100 tons; 800 acres of potatoes yielded 4,800 tons. Eight thousand quarts of small fruits were marketed.

Throughout Montezuma and Marcos valleys are countless traces of extinct races of men, showing that the valleys were densely populated at some remote period. The town of Marcos is the outfitting and starting point for exploring parties and tourists visiting the homes of the cliff dwellers of the Marcos canyon.

Across the western boundary line of the county in the canyon of the San Juan are famous placer mines where a large force of men are constantly at work washing gold from the sands of the river bed. At Marcos are belts of gold-bearing quartz which are being developed at the present time.

With its water resources carefully utilized and irrigation intelligently applied, Montezuma county, with its diversity of resources and perfect climate, will become one of the richest counties in the State.

LA PLATA COUNTY.

La Plata county is rich in agricultural, grazing, mining and manufacturing resources. It embraces an area of 2,700 square miles, 1,728,000 acres. The northern portion is mountainous and is being prospected constantly for the precious metals, the middle portion or foothills contain the coal measures, while the southern belt is agricultural. The county is well timbered and lumber of excellent quality is manufactured and exported in large quantities.

WELL WATERED.

Four large rivers, the La Plata, Animas, Florida and Pine, flow through the county, affording ample water, if properly utilized, to irrigate all of La Plata's agricultural land and large areas of that in New Mexico.

Although mining and manufacturing are the leading industries of the county, agriculture affords a sure way to wealth and the farmers of the county are among the most prosperous citizens. "Denver prices with freight added" make profitable selling figures for the farmer who raises alfalfa, oats, wheat, potatoes, vegetables and small fruits, and farming under these conditions pays handsome profits.

IRRIGATED DISTRICTS.

There are at the present time four irrigated districts in the county. That watered by the Animas extends along both sides of that river for twenty miles north of the city of Durango. Water is taken from the river in gravity ditches by the individual farmers. In many localities the supply is a hundred fold greater than needed at the commencement of the irrigating season and insufficient, as now used, at its

close. No reservoir or storage system is used, although the facilities are excellent for building reservoirs, and the cost, considering the large number of farmers to be benefited, trifling. Here also, as in many parts of the State, the question of the duty of water is but little understood, and crops are injured by the application of too much water in the early part of the season.

The La Plata district is west of Durango, and is watered from the La Plata river. The acreage in this district in La Plata county is small, but a large canal has been constructed by the La Plata Irrigating Company, and water taken across the Ute Indian reservation to the fruit lands of New Mexico, a distance of thirty miles, in the vicinity of Farmington. The canal is well constructed, and has a capacity of 200 cubic feet per second. Were the Ute Indian reservation, through which it passes, under cultivation this canal would irrigate several thousands acres of land in the reserve.

The Florida district is watered by the Florida river, a branch of the Animas. In this district 10,000 acres are under ditch, which is owned jointly by the farmers of the district. It is built to the line of the Ute reservation, and in the event of opening the reservation to settlement its capacity will be augmented by storage systems, so that a large body of reservation land may be irrigated by it.

Similar conditions exist in the Pine river district, in the eastern part of the county, where the present systems, adequate for the cultivation of the land now under ditch, can be enlarged to reclaim larger areas.

THE UTE INDIAN RESERVATION.

The greatest drawback at the present time to the agricultural growth of southwestern Colorado, and the sole cause of the predominance of mining interests over agriculture in the past, is the fact that a strip of land, fifteen miles wide and 110 miles long, is maintained along the southern boundaries of Montezuma,

La Plata and part of Archuleta counties as an Indian reservation, that of the southern Utes.

The reservation is crossed by seven large streams, having their sources in the mountains to the north and flowing southwesterly across the reservation. The valleys, or first bottoms, of these rivers are narrow and contain but little farming land; but, lying between them, and at an elevation of one to three hundred feet, are large tracts of level "mesa" lands. Within the reservation are upward of 500,000 acres of these lands, extending southward into New Mexico. No part of these table lands, either in the reservation or below it, can be farmed without irrigation, nor can any part of it be irrigated except by means of large systems established in or above the reservation.

The Utes, who number about 1,000, have scarcely more than 100 acres of this immense body of rich land under cultivation. They are a lazy, shiftless lot of "blanket" Indians, and what effort they make, outside of gambling, to make a living is by raising stock. This they cannot do with any great measure of success, as they find it difficult to keep their stock from roaming beyond the narrow limits of their reserve, and their pasture constantly suffers from encroachments from the outside.

The association desires Congress to retain the Indians on their present reservation, dissolving the tribal relation, and apportioning the land to them in severalty, and it is possible the fatal mistake of doing this will be made.

Their reservation, if the treaty made with them should be ratified, would add nearly half a million acres of rich farming and fruit growing lands to southwestern Colorado. Several extensive irrigation schemes for its reclamation are contemplated, and, instead of now lying idle, a wilderness of sage brush and cactus, it would soon by the enterprise and energy of the citizens of the southwest become a region "fair as the garden of the Lord."



UTE INDIAN RESERVATION, SOUTHWEST COLORADO.

THE ART OF IRRIGATION.

A PRACTICAL ILLUSTRATION OF THE DUTY OF WATER.

BY T. S. VAN DYKE.

THE illustration belongs properly to the chapter on the duty of water which is some distance ahead. It is given here because other illustrations are not yet ready. It shows a field of barley that in 1893 with a rainfall of thirteen and one half inches (all in the winter), the only wetting it received, yielded by the machine measurement sixty bushels of barley to the acre for the average of a large field. This was in San Diego county on the San Marcos ranch. It is some twelve miles from the coast. It was not done on fog either. But the character of the Southern California spring, which is cool with considerable cloudy weather about the time the heads are filling, is a factor that makes this hardly a fair test for the duty of water elsewhere.

The level of the water below the ground here was twelve to sixteen feet and had nothing to do with the crop. This thing has been done repeatedly in California; and on land well summer-fallowed and well cross-plowed in the fall can be done in almost any season on twelve inches of rain if the distribution is at all reasonable.

This year on the same ground eight acres of wheat yielded fifteen bushels to the acre on a rainfall of seven and a half inches with a distribution anything but good. On land plowed the spring before and well plowed again at planting twelve to fifteen bushels of wheat and

double that of barley or corn have been repeatedly raised here in the driest years on record. Some verifications that I have sent for have not yet come in in time for this issue of THE AGE, but I will later on present some even more remarkable than those above given, though I am not able to get a picture of them.

I do not intend by this to discredit the statistics of the government, but only to show that they do not in all cases apply. And if wrong in one case they may be in others. Probably they come near the average results for the whole country. In many parts of Southern California the soil is extraordinary in its retention of moisture. I know nothing like it in the East. The cool weather of spring at the filling time of the heads also increases very much the yield. But there may be many places East where the same conditions make necessary a far less amount of water than is shown by the government reports or experiment stations.

The weight of the above crop to the acre would be about as follows:

Grain one and a half tons.

Straw, without grain, one and a half tons.

Roots and stubble about one ton.

Making about four tons an acre from thirteen and one-half inches of rain.

This is nearly four times the yield generally considered possible from that amount of water.



GRAIN FIELD, MAN-HIGH, RAISED WITH 13 INCHES OF MOISTURE,
SAN MARCOS VALLEY.

THE VAN DYKE PAPERS.

The series of papers entitled, "The Art of Irrigation," begun in THE IRRIGATION AGE of January, 1894 is conceded to be the greatest contribution yet made to the literature of irrigation methods. The author, Mr. Theodore S. Van Dyke, is a writer whose several books and frequent contributions to periodical literature have won him a most enviable reputation. Arrangements for the present series were concluded nearly a year in advance of the publication of the initial article, and Mr. Van Dyke made a careful, special study of his subject before beginning the work, although he has been for a great many years both a student and a practical man in this direction. He has had wide opportunities of observation, but his schooling has been principally in Southern California where irrigation has wrought out its highest

forms. Owing to the crowd of special matter in this number of THE AGE, Mr. Van Dyke's usual full paper is omitted, but in the October issue one of his most valuable contributions, dealing with "The Choice of Methods," will be published with illustrations. This series of papers will continue for several months and extend well into the year 1895. The papers that have thus far appeared are as follows:

JANUARY—"Irrigation an Art that must be Learned."

FEBRUARY—"Methods of Mexico and Italy."

MARCH—"The Dangers and Evils of the Flooding System."

MAY—"The Mistakes of Early Irrigators."

JUNE—"Methods of Chinese and Italian Market Gardeners."

AUGUST—"Water Measurement and Delivery Considered."

THE STARTING, CARE AND CURING OF ALFALFA.

BY B. F. SHUART.

UNDER proper conditions and skillful management alfalfa is a crop of magnificent possibilities. But the difference in the practical value of the results between perfection and mediocrity in growing this wonderful plant is so great that no one who contemplates undertaking its culture should rest content with a low ideal of achievement. Let the beginner resolve at the outset that he will rest satisfied only with the highest attainable success, and that he will spare no pains which may prove necessary to its realization. The following suggestions with reference to the management of alfalfa are not offered with any pretense to infallibility, but simply as outlining the methods by which the writer was enabled, after having experienced his full share of failures, to reduce the successful cultivation of alfalfa to a basis of certainty.

SELECTING AND PREPARING THE GROUND.

In starting alfalfa the first point claiming consideration is the selection and preparation of the soil. Bench land is preferable to bottom land, and sandy loam is more desirable than clay, though some clay soils answer well for alfalfa, but the plants are longer in becoming established. Alfalfa should not be sown on sod for the reason that so valuable and permanent a crop should never be laid on a surface rough and difficult of irrigation.

The plowing should, if possible, be done in the fall. In the spring, before seeding, the land should be carefully graded to a surface so even as to obviate the necessity for the irrigator ever to step into the growing crop to force the water with the shovel. Whoever neglects to do this will, when too late, have abundant and unceasing cause to repent his folly. The labor and cost of grading land at the outset are infinitesimal compared with the aggregate labor and loss incurred in irrigating rough, uneven land twice or thrice each season for an indefinite term of years. After grading, and immediately before sowing the seed, the land should be flooded. Irrigation at this stage serves a threefold purpose. First, it reveals the high spots, if any remain, and these should at once be worked down and irrigated. As soon thereafter as the ground will bear working, the seed should be sown.

Secondly, irrigation before seeding insures the prompt and complete germination of the seed. This is a point of vital importance, for without a dense and uniform stand of plants it is not possible to make a high quality of alfalfa hay. If the stand is thin on the ground the stalks will be coarse, woody and indi-

gestible, and in curing the leaves will dry and fall off before the stems are sufficiently cured. But if the stand is thick the stems will be fine and the foliage will be so abundant that the curing process can be effected evenly and without perceptible loss of leaves.

One who has not had experience in feeding alfalfa, especially to sheep, cannot realize the immense superiority for feeding purposes of a high quality of alfalfa hay, such as I have described, over a coarse, stemmy quality. The one is peaches, while the other is but the stones, and the substitution of the one for the other will produce a marked change in the general appearance of a band of sheep within forty-eight hours.

RESULTS WHEN IRRIGATED.

In starting alfalfa, I am aware that the almost universal practice is to trust to the fickle and scanty showers for moisture, or in the absence of these, to sheer luck. Doubtless now and then a fairly satisfactory stand is secured in this way. I followed this system myself during the earlier years of my experience as an alfalfa grower, in Montana, with the result that fully one-half my efforts resulted in flat failures, while I never, in a single instance, attained to a degree of success comparable with that which I realized uniformly after I began to irrigate before seeding. Judging from an observation of alfalfa fields in several of the arid States, I am forced to believe that the great majority of alfalfa growers are practically ignorant of what constitutes a strictly first-class stand of alfalfa. And this because the system of seeding in vogue is one which depends for its success upon a combination of favoring conditions which rarely happens. The danger is, when rain is depended upon, that the sun and wind will dry out the soil to the depth of the seed before it can take sufficient root to survive. I have had whole fields perish in this way after the seed was well sprouted. But irrigation immediately before seeding, completely obviates this danger by supplying the soil with a fund of moisture compared with which a copious shower is a bagatelle and which causes the seed to spring with a rapidity and completeness scarcely attainable otherwise.

A third advantage secured by irrigation before seeding is that it supplies the earth with a reservoir of moisture sufficient to sustain the plants in unchecked and vigorous growth until they are strong enough to bear irrigation without injury. The critical time with alfalfa is the first six weeks of its growth. Flooding during this period is quite certain to give

the plants a backset from which they seldom fully recover before the second or sometimes not until the third year. And it is not often that, in the arid States, the rain falls with sufficient frequency to dispense with the necessity for irrigating the plants during this period. By soaking the earth before seeding, however, the plants will make vigorous growth until they are ten to twelve inches high, after which they may be irrigated with safety. Under this system I never failed to take two crops the first season, aggregating, perhaps a ton and a half to the acre in two cuttings, provided the seeding was done not later than the 20th of May. From the first crop of the second season onward the yield was full fledged.

TIME AND MANNER OF SOWING.

Alfalfa should not be sown until the danger of hard frost is past. I have seen very young alfalfa survive frost; and I have seen it completely destroyed by it. It is not prudent to take the risk.

A point scarcely second in importance to that of irrigation before seeding is that of burying the seed to a sufficient and uniform depth. For this purpose I know of nothing equal to the press drills. The seed should be put into the grain box and be run down the spouts. But with the drill great care must be taken not to bury the seed too deep, for too deep seeding is quite as fatal to success as too shallow. A depth of two inches is about right. Whatever implement may be used for covering the seed it should be followed by the plank drag to smooth and compact the surface. When the drill is used, twenty pounds of seed should be sown per acre; but if broadcasted, thirty pounds should be used. Great care should be exercised in the selection of seed to see that the grains are plump and healthy and that it is scrupulously clean. If it contains many shrunken seeds reject it, for if they spring at all they will produce only puny, worthless plants.

After alfalfa has become established, a single copious irrigation after each cutting will ordinarily be found sufficient. Irrigation before cutting is undesirable, because it leaves the earth so soft as to interfere with the movement of loads.

MAKING ALFALFA HAY.

The conversion of a heavy mass of green alfalfa into a choice quality of hay is an operation calling for no small degree of skill and experience. But the process is one to be learned by intelligent observation and practice, rather than from written description. The first and second crops of each season need to be cured with special care or they will certainly mold in the stack. Beginners need to beware on this point. The knack to be acquired is that of curing the hay sufficiently to insure its keeping sweet in the stack,

without becoming so dry as to shed its leaves in the handling. This cannot possibly be accomplished by curing fully in the swath. A method much practiced is to rake the alfalfa while still quite green into windrows, where it is allowed to cure somewhat more, and finally to make it into moderate sized cocks in which it is allowed to stand until ready for the stack. This process makes very nice hay, but where a large acreage is to be taken care of it is too slow and expensive. Alfalfa may be cured with entire success in the windrow, but it is important, when cured in this way, that there be ample facilities for putting it into stack very rapidly when ready, otherwise it will become too dry, and much of it will be lost in the handling, especially if it has to be carried from the field on wagons. Alfalfa should be cut on the first appearance of bloom.

STACKING MACHINERY.

After trying a variety of appliances for stacking alfalfa, I found the so-called table rakes (which are simply an improved form of the old "go-devil"), and the ricker which supplements them, the best suited to my conditions. By means of these rakes the hay was taken from the windrow by horse power, and was conveyed to the stack in masses weighing from 200 to 400 lbs.; was there delivered to the ricker, and was by the ricker landed into the middle of the stack. The only hand power required was for the distribution of the hay after it was placed upon the stack. Five men and five horses with two rakes and the ricker easily put thirty tons of hay per day into stack, at a cost, as wages were, of about thirty-five cents per ton.

The great drawback to these rakes is that they can be used to advantage only on short hauls. The plan on which I had laid out my farm happened to be one, however, perfectly adapted to their use. The special feature referred to was a system of parallel roads running through the farm about thirty rods apart. These roads were protected from the irrigation water by ditches on either side, and the fields consisted of the long and comparatively narrow belt lying between the roads. The alfalfa was cut in blocks of about ten acres, and was stacked in the road immediately adjacent. The stacks were thus distributed on the roads all over the farm, but as the hay was used for feeding stock this arrangement was not objectionable, while it reduced the cost of moving the hay during the most busy season to the minimum.

I have received many requests from men who are bringing new lands under alfalfa for helpful suggestions as to how to proceed. Were I to attempt to condense my advice into a brief paragraph, I should say: First subdue your land by one or more grain crops; then carefully lay off your farm by a system of fields and of roads having special reference to convenience and economy in handling the crop. Next grade your fields so perfectly that, in irrigating, when you shall turn the water from the ditch, gravity will do the rest. Then irrigate your land and sow your seed. And, finally, let there be one man on the place who shall make it his business to master the details of irrigating, curing and stacking alfalfa, and who shall exercise personal oversight of these processes; and let this man, if possible, be the proprietor himself.

A LITTLE STUDY OF THE DIVERSIFIED FARM.

BY C. E. MITCHELL, OF GRAND JUNCTION, COLO.

REFERRING to your desire expressed in the May number of *THE AGE* for suggestions as to the best crops for farmers to raise on irrigated farms in this portion of the arid region, I desire to make the following remarks, based, not on any practical experience as an actual tiller of the soil, but on fourteen years residence and observation in western Colorado, during which time I have seen the valleys of the Grand River, and its tributaries in Colorado, in the various stages of development, from the time when the Indians formally abandoned it under the terms of a governmental treaty up to the present time, when all the valleys without exception are fairly settled and are acknowledged the best agricultural and fruit raising section of the great Centennial State.

As a matter of fact the Indians never did have any use for this valley country at any time, regarding it only as a desert stretch over which they were forced to travel at times in journeying to and fro between the high mesas which suited them much better, affording, as they still do, excellent hunting and fishing, as well as good pasturage for stock.

What applies to irrigation, as it has come under my observation in western Colorado, will, I believe, apply with equal force to the whole of the arid section in which you included Colorado.

During the time I have given this matter attention I have seen hundreds of examples of the folly of the average farmer attempting the cultivation in an irrigating country of a large body of land. In nearly every case the only result is a complete failure. The exception only proves the rule. And, as I presume these things are well known to you, I will assume in my suggestions that we are speaking to the farmer who attempts the cultivation only of five to twenty acres.

I suggest that every farmer starting in a new country on virgin soil should, first of all, believe thoroughly in that great American idea—INDEPENDENCE! Following this thought along to its true meaning, he will determine when first settling in his new home to raise everything he possibly can which may be necessary for the support of his family and what work and live stock he may have.

I have observed that the family which sat down to their Thanksgiving dinner after being in their new home a little over a year, and thanked God that, by hard work on their own part, supplementing the sunshine and water provided by a beneficent providence, every article of food on the table for that meal was

produced from their own farm, was at the end of five years much better off than some of their neighbors, who perhaps worked as hard but devoted all their energies to "raising something to sell."

THE GARDEN PATCH.

Observation and inquiry convince me that the beginner should first of all lay off his garden patch where he will raise potatoes and such other vegetables as are needed for home use. This ground should be carefully leveled and fenced. Right here let me say that the leveling of ground is a most important item in irrigating countries. No one thing will, in the long run, pay the farmer better in the saving of time and labor than work spent in the very start in leveling land and laying out his ditches so that he can water his land to the best advantage.

After deciding on the vegetable garden his next thought should be to provide for his horses and cows. The number of these should depend on the amount of work to be done and the size of the family. Some can get along very well with one horse by trading work with their neighbors, but there should most certainly be enough cows to supply the family with plenty of milk and cream and all their butter. If there is an occasional extra pound or two to spare so much the better. It can always be sold at the grocery store or exchanged with some less fortunate or less thrifty neighbor.

After the horses and cows have been provided for attention should be given to the matter of poultry. Enough hens should be kept to furnish all the eggs and chickens which the family will use, and, like the butter, any surplus will always find a ready market.

The absolute essentials of life having been provided for, it remains to be decided what shall be done with the balance of the ground. A small patch may be very profitably given to a strawberry crop. This fruit most generally finds a ready sale when ripe, or it may be easily worked up into canned goods or preserves and sold later in the season.

THE ORCHARD.

Next comes the problem how much to put into orchard. Generally speaking, it seems to me best if about half of the remaining land is put in trees and vines, leaving the other half for diversified crops, which may be rotated as necessary or desirable with the portion already set aside for garden and pasturage.

What kind of trees are most desirable is a question each person must settle for himself. But in a

general way I would suggest that peaches, pears and apples be so arranged that there is left eventually a good apple orchard. Whatever is done in this line however, let the farmer always be prepared so that if the crop of fruit should happen to strike a glutted market he can dry, can or preserve it in some shape so as to save it until some future time, when he may market it more profitably.

SUGAR BEETS AS A SURPLUS.

We now arrive at the question of what surplus can be most profitably produced. I do not think that an average farmer can profitably and successfully use more land than has been indicated along the lines mentioned. Certainly exceptions will be found. Some men are especially adapted to fruit culture, others naturally prefer live stock, but I speak now for the average farmer—men who farm because they prefer the free, independent life of the agriculturist, where each man's time is his own, and the profits—always in exact ratio to the amount of intelligent labor performed—are all his. To such I would say: Plant your remaining land in *sugar beets*, and be prepared to utilize the crop.

Why do I suggest sugar beets? First, because nearly all this arid region, when irrigated, is well adapted to their culture, and all recent experiments show conclusively that sugar beets will mature much better and contain a larger amount of saccharine matter when raised in a warm, dry climate than when cultivated in the moist and damp atmosphere of the eastern States. Men who have given the subject much thought and study are united in the belief that what was once known as the Great American Desert will in time become the source of the sugar supply of the United States. Of course, wise and patriotic action by the national government would very materially hasten this. But sooner or later it is destined to come. So I say raise sugar beets, because they are well adapted to the country, and their successful culture will sooner or later bring a factory in your neighborhood; then you will always have a market for all your surplus crop at fair prices.

But you ask, "What shall I do with my crop until a factory comes, or suppose it never comes at all?"

To this I answer it is a crop which may be used in a dozen different ways if you only prepare to utilize it, and it need never be thrown on an unprofitable market if properly handled on the farm. Practical experiments demonstrate that it is a most excellent stock feed, and may be used with the very best of results wherever corn is used in corn countries. Generally speaking, dry countries in Western America are not well adapted to corn culture. The very fact of nearly all the nights in our hottest months being comparatively cool prevents corn from growing and maturing as it should. But in the sugar beet, con-

taining as it does from 200 to 300 pounds of sugar to every ton, we have a most valuable substitute for corn. Can you think of any food more fattening for hogs or cattle? The flesh it produces is hard and firm, equal in every respect to the very best corn fed. It may be fed with equally good results to stock of all kinds. I would suggest first the hog, because when killed, if the local market will not pay all you think it worth, you still have the alternative of rendering the lard, smoking the hams, and salting the sides, all of which may be kept until such time as the market is right. If your home market is too small your product is in a shape which will stand transportation to some large center or better market. It will be many and many a year yet before hog raising is over done in Arid America.

But beets are not alone useful as hog feed. They may be fed with equally good results to all kinds of stock. When given to milch cows the flow of milk is quickly increased; cooked, they very soon fatten old cows. Horses easily learn to like them, and they are good food for sheep.

Another strong point in favor of sugar beets is—they are a crop which can be produced on the same ground many years in succession, as the tops left on the field when the crop is harvested replace nearly all the elements which have been taken from the soil. The sugar in the beet having been absorbed largely through the leaves from the sunshine. For all these reasons, and many more which constantly become apparent as this crop is more extensively cultivated, I favor the idea of the farmer in this section of the arid region making sugar beets his surplus crop, provided only that he prepares beforehand to utilize it. It would of course be folly to plant them unless you had some stock to which to feed them.

One other important suggestion and I am through. Every new settler in the very beginning should plant as many shade trees as possible. First, as wind breaks and for the grateful shelter they afford; and, secondly, because until you have shade trees, and the resultant moisture in the air, you cannot to good advantage successfully raise such small fruits as currants, blackberries, raspberries, etc. All of which, when raised, should be handled, as far as marketing is concerned, in the same manner as indicated for strawberries.

If settlers in our new country would work along the lines suggested, I believe it would only be a few years until they would find themselves comfortably well fixed, as the saying is, and each succeeding season their wealth increasing. The old free and independent spirit of our forefathers would be renewed as men found themselves more their own masters and further removed from the baneful influences of large corporations, trusts, monopolies, etc.

TALKS WITH PRACTICAL IRRIGATORS.

"BETWEEN WIND AND WATER."

BY J. W. GREGORY.

THE people residing upon much of the semi-arid land of the United States find themselves literally in the condition described by the above caption, and it may prove a lucky fact for them if they but employ their intelligence making the wind above their heads lift the water from beneath their feet, and employ the latter in irrigating their rich but thirsty lands.

ABUNDANT SUPPLY OF WATER.

Under millions of acres of the finest land in the world, in tracts of various sizes, generally very large, scattered all over Arid America, there exists an abundant supply of water, within such depths that it may be hoisted to the surface by various appliances, and used for irrigation purposes. Constantly drifting above the same lands are mighty currents of another and lighter fluid, and in these currents go to waste every hour untold units of power, power which is simply aching to do something, and, in devoid of useful occupation, as we are assured by the poet,

"It doant no what on airth to dew with itself, but flys about,
Scatterin' leaves an bloin off men's hatts,"

and doing much more serious deviltry at times.

UNLIMITED WIND POWER.

Manifestly the proper thing to be done is to harness the forces of these mighty air currents and put them to work, bringing to the land water to replace that which they have so long and so industriously been carrying away.

Some genius of a speculative, as well as a mathematical, turn has figured out how many thousand horsepower go to waste every day in the average wind which blows over the average quarter section of land upon the great plains. We do not just now recall the exact figures, nor is it necessary. Suffice it to say, there is enough. In fact, the quantity runs well up into big figures.

KANSAS ENTERPRISE.

Already the importance of utilizing a fraction of these vast forces in lifting subterranean water to the surface for irrigation purposes is obtaining substantial recognition in a number of localities in California, New Mexico, Kansas and elsewhere. This is notably true of the Arkansas Valley in western Kansas, where, in the vicinity of Garden City, an extensive and valuable experience has already been acquired

by the settlers in the matter of utilizing wind power for hoisting water for irrigation purposes. Some of the pumping plants have been in operation for upward of five years and have given so satisfactory results throughout that a great many similar plants have been installed the past and current seasons, and the practice of windmill pumping for irrigation is spreading very rapidly. Garden City has been the progenitor of much that is valuable to the progress of irrigation, and probably of nothing that has been, or promises to be, of more immediate and practical value than the successful inauguration of the practice of irrigation by pumping in the semi-arid region.

For some time past the people of other localities have been taking note of the success gained in this way at Garden City, and following the example set by the enterprising people there. In the past sixty days people from other portions of the country have gone, singly and in companies, to inspect and study the pumping installations in that locality. Windmill manufacturers, with an eye to business, have had experts on the ground for weeks gathering facts and ideas for their guidance in taking advantage of the demand for wind engines which they anticipate. Parties of farmers from distances of upward of a hundred miles have traveled across the country by team to spend a few days among the pumps and reservoirs and take notes for use in their own neighborhoods, and last month a party of fifty from northwest Kansas chartered a passenger car and so made a pilgrimage to this center of practical irrigation, where they were handsomely entertained and given all the information at the command of the people of the city and vicinity.

THE PRACTICE EXTENDING.

While the conditions are such in the Arkansas Valley as to render irrigation by the use of windmills peculiarly valuable and easily secured, because of the slight lift required, the cheapness of wells and abundance of water, yet the practice is spreading rapidly to higher lands and to localities where much more costly installations will be required, yet where they will be made of very great practical value.

It may easily be shown that irrigation by this means is really expensive and not economical, from a theoretical standpoint. It may be shown that the cost per acre per year of installing and maintaining a windmill pumping plant is greater than the cost of irrigation by various other means; but the method is practical and valuable for several reasons.

AN INDEPENDENT WATER SUPPLY.

It is within the means and immediate reach of the individual. The farmer who realizes the necessity and value of irrigation and has the courage to undertake things need not wait upon the advent of a "ditch company," nor the coöperation of his less enterprising neighbors, but may successfully set up in business for himself without delay. Furthermore he may have an independent water supply, secure from the annoyances incident to leaking dams, washed out headgates, quarreling over the division of a scanty supply, and the hundred and one unpleasant features which may attend securing water from a company or community ditch or reservoir. It may be located upon whatever portion of the farmer's land he may prefer, in most cases, and the means of irrigation thus made to conform to the taste and convenience of the irrigator to a greater extent than can ordinarily be the case of water supply received from canals.

But the greatest value of the windmill as a factor in the irrigation problem lies in its present obtainable and immediate usefulness to the isolated farmer who could not expect to secure the benefits of water from a ditch—"it may be for years and it may be for ever;" and in the fact that it constitutes a sort of safeguard, or sheet anchor—a means of "holding on"—for the settler upon the lands of the semi-arid region. The dry farmer upon such land can, by means of a windmill, pump and reservoir of very moderate cost, provide for his own table and thus make sure the means of subsistence of his family through the recurrent seasons unfavorable for crop growing upon his non-irrigated land, besides adding greatly to their comfort, convenience and healthfulness—and his own profits—every year.

The windmill is destined to prove a very important factor in the irrigation problem throughout a very large proportion of the country.

CULTIVATION OF CANAIGRE.

BY W. C. FITZSIMMONS.

THE importance of cultivating canaigre for tanning purposes is becoming more and more apparent as investigations are pursued. Consul Monaghan, at Chemnitz, Germany, has lately made inquiry into the demand for canaigre as a tanning agent in Germany. A moderate price for the dried roots of this plant in Vienna is stated to be about 3½ cents per pound, or say \$70 per ton. Experience in the extensive use of canaigre has shown it to possess certain features not found in most other substances used in the preparation of leather, which make it especially valuable. Leather produced by means of canaigre comes out smooth, soft, with good grain and a clear, bright color. It is regarded as especially valu-

able in the preparation of fancy leather for the use of saddlers and others.

WORLD-WIDE DEMAND.

From Mr. Monaghan's investigations and observations it may be assumed that the demand for a properly prepared article of canaigre would be practically world-wide; for tanning in some way or other is an ancient art, and there are few countries where tannin in some form is not extensively used.

Consul Monaghan learns that a single tanning firm in Scotland has offered to buy 10,000 tons of canaigre at \$40 per ton; and wherever its merits are known a ready sale awaits it.

This plant yields a high percentage of tannin, and is alleged to average from 20 to 35 per cent.—a much higher average than most of the barks from which nearly all tannin is now extracted for commercial use. The demand and the market for canaigre may therefore be assumed to exist to a practically unlimited extent; it remains then for the men of the arid region to step in and profit by this fact.

AREAS ADAPTED TO ITS GROWTH.

There are millions of acres of land adapted to the growth of canaigre, and it already grows wild over wide areas, throughout the southern portions at least, of the arid belt. How far north this plant may be grown with profit has not been demonstrated, but in New Mexico, Arizona and Southern California it grows extensively and thrives luxuriantly. It is well known that the principal sources of tannin, the oak and hemlock, are being rapidly exhausted, and that our own tanners are searching the world for material for their use. Gambier is imported in large quantities and at great cost to supply this need, and in 1891 the value of this import alone was over \$1,500,000. From the fact that a general demand for tannin exists in all countries at a reasonable price, and from the fact, too, that the sources of previous supply are being rapidly depleted, if not exhausted, under increasing demand, it must follow that a practicable and adequate source of supply for this substance promises good results for producers. And the special adaptability of canaigre culture to the arid zone points to that region to supply the world with a staple article of commerce for all time to come.

EXPERIMENTAL CULTIVATION.

It has not been fully demonstrated as yet on a large scale what the productive capacity of the plant is under favorable conditions; but the results of experiments made at the Arizona Agricultural Experiment Station, and also by private individuals in several places, point unmistakably to profitable results from the cultivation of canaigre under irrigation. It has been found in practice that it is difficult to secure a good stand of canaigre from planting the seed, and

that much better results are obtained from planting the roots. This fact is not so serious a drawback to its cultivation as might at first be supposed; for the roots planted do not decay, it is alleged, and may be dug and used when harvesting the crop which sprang from them. The seed, therefore, costs practically nothing, and the setting aside of a certain amount of roots for planting is all that is required. It might well be that the continued planting of the seeds of the canaigre would result in producing improved varieties, as with potatoes, and the seeds of various fruits and plants. No doubt, however, the work is being done at the several Experiment Stations in the canaigre districts, and we may reasonably expect some beneficial results to flow from this line of experiment.

Large amounts of canaigre roots are now gathered from the public domain and prepared for market; but in view of the great importance of creating an industry by aid of this plant its welfare should be guarded and its extermination from its natural *habitat* should not be allowed. The government endeavors to preserve its forest lands from spoilation, and it might well undertake the collection and distribution of canaigre roots to those who would guarantee their care and cultivation. Probably the greater part of the canaigre now growing anywhere is on the public domain; and while its preservation for use by those who would create a new industry might appear to partake of the paternalism which is so obnoxious to the Honorable Secretary of Agriculture, yet practical wisdom would suggest that the elements of a valuable industry soon to develop from plants now growing wild on the public lands should be carefully guarded from annihilation.

METHODICAL DIVERSITY OF PRODUCTION.

BY J. W. GREGORY.

DIVERSITY of production ought to be a hobby with practical irrigation farmers. "Don't put all your eggs in one basket" is an admonition it is well to heed, however trite the saying. No matter how carefully one may plan and plant and cultivate, any crop will be a failure sometimes, and it is only taking counsel of ordinary prudence to have a sufficient diversity of products to make a success of one sort when another fails. The man of one crop must be fortunate in his location and wise in his selection to stand any show of continued success.

NEED NOT BE A MOSSBACK.

But diversity of production does not mean a constant "bobbing around" from one sort of crop to another, from one list to another, growing one kind or list of crops this year and changing to something entirely different next year. Experiment is all well

enough and one need not include moss on his own back among his crops. It will often be advantageous to try new things and to shift from one sort of crop to another, but the man who grows peas, potatoes and sweet corn for market this year, cabbage, tomatoes and celery the next, and cucumbers, onions and spinach another time, always planting what brought a good price, or what an intelligent or fortunate neighbor made an exceptionally good return from the preceding season, will find that, as a rule, he is keeping just about a year behind the good prices and that he does not get on remarkably well.

HAVE A SPECIALTY.

A good specialty is the very best foundation for a diversity of crops. And it is not a bad idea for one to have a limited line of tested and successful specialties and stick to them. One may well make an orange grove, an apple or prune orchard or an alfalfa field his *pièce de résistance*, combine with the chosen leading specialty other standard lines in which he has experience, and then experiment cautiously, but on a limited scale, with other things. The leading special crop will be a failure, total or partial, at times, or prices for the product will rule low; but in such cases the "side lines" will pull the farmer through, and if his selections are wisely made, he will profit by perseverance.

"SWEET-POTATO PEARCE."

We have in mind a good example of the success following an intelligent adherence to a well-chosen specialty. A located Methodist minister, Eld. J. F. Pearce, residing in Finney county, Kansas, has for the past ten consecutive years planted five acres each year to sweet potatoes. He does not mind the fact that this has gained him the sobriquet of "Sweet-Potato Pearce," inasmuch as the crop has paid him an average return of \$200 per acre per year for the period mentioned. He has not grown exceptional crops, nor, indeed, a very high average; but all the work has been done by himself and family, so that what is received is very nearly net gain, so far as the cash account is concerned. He has had plenty of time to devote to other matters right along and has made a good plain living for his family.

His long experience in handling this crop has made him an expert, both in safely growing it and in getting the most possible out of it. He knows when and where to market the product to the best advantage. People and dealers in his vicinity who want anything in his line always know where to go to get it so long as his stock holds out. He has a cheaply constructed root cellar in which he keeps an average of 250 bushels through each winter, and he "beds" a stated quantity each spring for growing plants, for which he has a ready sale. Sometimes prices are

very low, but other seasons they are high enough to make up for it and so maintain a remunerative average.

ONIONS.

Another small farmer makes onion-growing his steady specialty and grows his two acres every year with satisfactory average results. He knows what varieties pay best, how and when to plant, cultivate, harvest, handle and market to best advantage. In fact, he has the special knowledge which only comes from long experience and which is worth money in any business—in growing sweet potatoes or onions to the same comparative extent that it is in conducting a banking business or operating a railroad.

OTHER SPECIALTIES.

Many instances might be given of those who successfully make a specialty of Irish potatoes, of cabbage, of asparagus, of strawberries, and so on through a long list of the products more commonly grown incidentally and in a more or less haphazard fashion, saying nothing of the great staple crops, the production of which absorb so large a proportion of the time and energy of the mass of agriculturists.

A PROFITABLE POLICY.

As in these cases, cited merely by way of illustration, so it should be with the man who devotes a larger acreage to the more common products. The sweet potato grower adds alfalfa and poultry to his list. The onion gardener has a somewhat varied but systematic line of other vegetables to supplement his one invariable crop. So the man who makes alfalfa growing his principal business will do well not only to have hogs and cattle or other stock to eat the alfalfa, but to grow at least one other sort of forage or grain crop to supplement it in sustaining and maturing his stock. An orchard and a garden should be considered matters of course and receive a full share of care and attention. And so it should be with the producer of wheat or corn, oranges, raisins or prunes. A wise selection may be made of other sorts of crops, the production of which will fit in with and around the "leader," and it may be accepted as a demonstrated fact that the experience of any considerable term of years will prove diversity of production, when intelligently practiced, the safe and profitable policy.

THE LIVE STOCK.

The "first assistants" of the irrigation farmer are—or will prove to be—the cow, the bee, the pig and the hen. Which of these is really entitled to be considered as chief probably cannot be definitely settled because it will be a matter of opinion, and opinion is largely dependent upon the point of view. The old cow feeds more babies, adds more to the good things on the table and probably pays more taxes and more interest on the mortgage—in an indirect way at least

—than any of the others. But mother hen also comes in very close to the head along the same lines. How seldom we think of, and how little do we realize the fact that the poultry yard beats the wheat field as a wealth producer! The pig, with his capacity for converting almost every waste and unprofitable thing produced on the farm into a profitable, cash article of merchantable pork, is not to be overlooked, and while the honey-bee may not figure so largely in the sum total of profits as do some of the others, it adds a big item of net profit, nevertheless, in addition to the important and indispensable services rendered as a bearer of pollen to and fro for the fertilization of the blossoms from which comes so large a proportion of our choicest and most valuable fruit. All are grand helpers and will return manifold all judicious expenditure of time and labor in their direction.

DO YOUR OWN MANUFACTURING.

ONE inflexible rule upon the irrigated farm should be: Send to market in its most condensed and valuable form everything you have to sell. Don't, as a rule, sell hay. Feed some hay to stock and sell horses, mules, cattle and sheep. Don't, as a rule, sell grain. Convert your oats, your barley, and also your wheat, into beef, pork, mutton, eggs, poultry, butter and cheese. There is an added profit in manufacturing hay and grain into these things and you should do the manufacturing on your own land and thus reap the profit.

In fact, there are two substantial profits derived from thus condensing the raw material of the farm. There is the larger return in cash received for the product and there is the fertility saved to the land in the way of manures, and both are most appreciable profits and will amount to a "pretty penny" in the course of time. Just look around you, and recall in mind also, taking note of the farmers who get on and make money, and you will find that they are those who make it a rule to send their grass and grain to market on the hoof, and in the butter-tub and egg-basket.

Condensation is the "rule of faith and practice" at the desk of every "able editor." It should be as faithfully and persistently applied by every practical irrigator. Practiced along the lines suggested, it will be found to affect in a most practical and individual way the silver question, the price of wheat, the per capita circulation, etc. "Condense," says the editor. "Condense all along the line."

LET THE STOCK GRIND THE GRAIN.

How people do run in ruts, like an old wagon! A few seasons ago, when corn was very cheap and farmers, in some instances, used it for fuel, many

people considered it little less than wicked to do so. They did not grasp the utilitarian fact that corn is a better and cleaner fuel than coal, and that circumstances may be such as to make it economical to burn the former instead of the latter. But the simple idea of burning up something ordinarily used for food, and not commonly used for fuel, is naturally repugnant to most people and doubtless many a man has shoveled a ton of corn into his wagon, taken the time and labor of himself and his team to draw it ten miles and shovel it out again, received less than \$5.50 for it and drawn back a ton of coal which cost \$7.50, or more, without observing that he had lost a day's labor and the price of another day's labor in cash in the operation, because it did not occur to him to use the corn for fuel.

WHEAT.

In disposing of wheat people are as much inclined to follow custom. Wheat is ordinarily exchanged for flour at the most convenient mill, or sold to the grain dealer, and hundreds of men have sold thousands of bushels of it at 50 cents per bushel, or thereabouts when it might have been used as feed and netted the grower a dollar a bushel or thereabout. Made into chop, wheat can scarcely be excelled as a food for hogs and cattle, or horses, and, either whole or ground, it is the food par excellence for poultry. Utilized in this way, it can be made to yield a remunerative price when shippers' figures are down in the neighborhood of the cost of production. Hence, we suggest to those who grow wheat, when the price is low, try taking at least a part of it to mill to your pigs, poultry and cows. A cheap chop mill and windmill or horsepower are first-class assistants in such case. This course will both benefit the grower who intelligently follows it by giving him a fair return for his product and aid in reducing "the visible supply" to proper limits.

THE SMALL FARM.

THE eleventh commandment, so far as irrigators are concerned, is: "Despise not the day of small things!" This is directed especially to the beginner and the prospective beginner in the practice of irrigation. Look out for the details. The work fairly bristles with details which may seem of little consequence to the amateur, but they are all big somewhere out of sight. If you are planting an orange grove or seeding a tract to alfalfa, remember these are truly perennial crops, and see to it that your ground is thoroughly prepared and that you know precisely how it is to be irrigated. Plant only healthy trees of any sort, and purchase stock from no one but a reputable and responsible dealer who understands his business and cannot afford to deceive you in any way as to quality or variety. If you are

building new ditches, be sure of your grades, get the ditches in the right place, and make every ditch broad and deep enough, every dam and embankment strong enough, have flumes so they won't leak and gates so they will clear. There is economy in having things right and sufficient for their intended uses in irrigation work.

DON'T WAIT.

If you have a quarter section you would like to irrigate and the water supply is not all in sight, don't wait for somebody or some company to undertake furnishing you water for the whole 160 acres. Get what water you can, and try an acre—or half an acre. There are 'steen thousand men living upon land which ought to be irrigated to produce the best results and who wish to begin, but are waiting and have waited for years for the appearance of some capitalistic company which shall make rivers of water flow where little or none ever was seen before. Don't wait on the big companies and great canals of water. Sink a well, or dam a draw, or impound the waters of a spring, or get a small supply of water from some source, and be rich—in experience at least—and know what you want to do and how you ought to do it, and what a water supply is worth by the time the big company arrives on the ground.

Furthermore, the little farm has proven and will prove the corner stone—and also the basement, side-walls and mansard roof—of irrigation. There will be men who can successfully conduct a bonanza farm under irrigation just as there are Marshall Fields in trade, Jay Goulds in railroad assimilation and Pulitzers in the newspaper business; but their numbers will be about in like proportion to the mass of irrigation farmers as are the phenomenally successful to the rank and file in other industries and callings. The mass of those who succeed to their own satisfaction and to the good of the community in irrigation farming will be those who do thorough work upon a small tract. It is a sort of situation where

"A little farm well tilled"

must be the rule if success is to follow effort.

One of the strongest proofs of the wonderful administrative ability of Brigham Young is the fact that he limited the farm unit, under irrigation, to twenty acres. He placed the limit high enough, and the results of fifty years' practical working have abundantly proven the wisdom of his regulations in this regard. It would be well if people would accustom themselves to contemplating irrigation farming on such a basis—the basis of the quantity of land a man can handle for himself.

Little beginnings, small areas intensely cultivated, small investments of cash until experience justifies branching out by safe degrees, these are some of the

small things which ought to be considered at their true value in the work of making homes by the help of irrigation. They will aid very greatly in achieving success.

Pecan Culture.—Considerable attention is being given to the establishment of pecan groves in various parts of the country. The natural groves of Texas and Louisiana, by the good profits they have given in recent years, have stimulated the culture of this valuable tree to such an extent that a few years hence the quantity of nuts offered for sale will no doubt be many times the present product. The pecan is allied to the hickory, and while the nut is one of the best grown anywhere, the timber is also most valuable for a number of purposes to which at present the hickory is generally applied. The pecan will not thrive in too rigorous a climate, and yet it does well in Indiana and parts of Illinois. It is in the milder regions further south, however, that we may look for the most satisfactory results from the culture of this nut. Some groves have been established in Florida by grafting the pecan upon the wild hickory which grows in thickets in many parts of that State.

A good deal of controversy has arisen in different parts of the country over the propriety or danger of removing the tap root of young pecan trees when transplanting from nursery to orchard. Though both sides of the question have been presented with considerable force and warmth, at times, yet it cannot be said to have been definitely settled. It takes so long a time to determine the matter from actual results of orchards planted in different ways, that he who plants pecans should avoid every possible risk, and plant the nuts where the trees are to stand, or use the utmost care in handling the tree while transplanting, so as to put the tap root into its place with the least possible disturbance of the few fine rootlets which may be attached. If we may reason from analogy we shall arrive at the conclusion that nature demands the tap root, and unless experience has shown it to be unnecessary to the tree in a state of cultivation, it were better not to take the chances of cutting it off.

The pecan, like most other fruit and nut-bearing trees, thrives best in a well-drained, porous soil, with no hard-pan near the surface. In planting a large, deep hole should be dug and then filled in with surface soil, taking care that all fine rootlets are spread out as they should be to insure the best growth of the tree. The earth should be carefully worked about the small roots by hand, only running water about the tree during the operation of planting; and if the locality is subject to high winds the trees should be staked for the first two years at least. When well grown, the pecan often bears abundantly, although the tree is slow to begin yielding profitable returns.

He who plants pecans must expect to wait eight or ten years for substantial returns, although five or six years may sometimes give evidence of value in a grove. A report was lately made of some pecan trees in Florida that yielded a return of \$32 each at seven years of age. But this is an extraordinary performance and cannot be relied upon for frequent repetition. Good pecans sold last fall by the carload at six cents per pound.

Running a Big Farm Does Not Pay.—The size of the average farm in the United States, as shown by the census of 1890, was 137 acres. It is said that in France the average farm comprises scarcely one-fourth of this acreage. That the farms of the United States, especially in the West, are generally too large is freely admitted by most thinking men who have given the matter careful study. One of the greatest drawbacks which the American farmer has to contend with is his own inclination or determination, either inherited or acquired, to own more land than he does or can properly cultivate or use.

For the ten years, 1880 to 1889, inclusive, the average yield of wheat per acre in Massachusetts was 16.3 bushels, worth \$20.74; Connecticut, 16.6 bushels, worth \$19.14; Vermont, 16.9 bushels, worth \$19.75. For the same period the average yield and value in some of the best of the large farm States of the West were as follows: Illinois, 13.4 bushels, worth \$11.32; Minnesota, 12.5 bushels, worth \$9.31; Iowa, 10.6 bushels, worth \$7.56; California, 12.5 bushels, worth \$10.35.

During the same decade we find the relative product and value of corn as follows: Maine, 32.2 bushels, valued at \$24.25; New Hampshire, 32.7 bushels, worth \$24.32; Vermont, 32.5 bushels, worth \$23.18; Massachusetts, 31.6 bushels, worth \$22.94.

How was it on the large farms of the West? In Illinois the yield was 26.7 bushels, valued at \$9.38; Iowa, 30.9 bushels, worth \$8.63; Kansas, 28.5 bushels, worth \$7.90; Nebraska, 32.8 bushels, worth \$7.58.

These figures will certainly prove a surprise to many western farmers, who generally believe their rich prairie soils to be much more productive than the farms of New England. While it is undoubtedly true that the western soils are more fertile, the diminished yield, compared with that from the worn soils of the far East, is so much the less creditable to the methods employed by the western farmer. All that could be said on this subject in a thousand pages of *THE AGE* could not more completely tell the story of loose methods on the farm than the few figures given above from the census of 1890. Farmers everywhere should study not only the best methods employed by the shrewdest of their craft, but should know also the history of their art, to the end that a

broader view of present and future requirements may be profitably taken. With irrigation and the small farm will almost certainly come better cultivation, fertilization and returns for the soil tiller in all parts of the United States.

Drainage.—The importance of adequate provision for drainage, along with the use of water for irrigation, is something which ought to be appreciated by practical irrigators in very many localities. Where but small, isolated tracts are watered, or the water supply is so scant, or the climate so arid that water never accumulates and stands in pools and puddles, drainage is, of course, a "matter of history" only. But where water is plentiful, so that it may be used to excess; or where there are at times a succession of heavy rains, or where any extensive system of reservoirs may be constructed, care will have to be taken that water is not allowed to stand in stagnant pools, nor to form groggy "seeps" and marshy places, else more or less land will be ruined for crop production, and regions now famed for their healthfulness will be troubled by malaria and by more or less malignant fevers.

A Dangerous Pest.—The Russian thistle, for extermination of which Senator Hansbrough, of North Dakota, asks the appropriation of \$1,000,000 by the general government, was introduced twenty years ago at a point near Yankton, and has been steadily adding to its domain since. An extensive bulletin just gotten out by the United States Department of Agriculture gives a map showing the reported distribution to extend over the east of the Dakotas, northeastern Nebraska and northwestern Iowa, with small spots all over the Dakotas, Nebraska, Minnesota and Wisconsin, and it has recently appeared in northwestern Kansas, and farmers there report its rapid propagation.

The Russian thistle very closely resembles the common "tumble-weed," but is more spinous. In fact it is a tumble-weed of the worst kind. When it breaks off at the root late in the fall, it rolls away in the wind at a rapid rate, scattering its seeds upon every rod of ground over which it travels. Well grown plants in the Dakotas are said to reach four and five feet in diameter, and even more in exceptional cases. The prickly branches are so dense that it is impossible to pass one's hand to the interior of the bushy plant.

The technical name of the pest is *Salsola kali*, and it is briefly described as follows: Herbaceous, annual, branching from the base, usually densely bushy at maturity; leaves alternate, without stems, long, spiny-pointed, and with narrow margins near the base, usually striped with red like the stems; flowers minute, at the bases of the leaves, without sepals or

petals. It blossoms in July and August and its seeds mature in September and October.

The extermination of the Russian thistle demands that it be smitten hip and thigh by a sharp hoe in the hands of an active \$1.25 a day man. Digging it up seems to be the only way to fight it. If it is hoed or plowed up before it goes to seed it is likely to leave no posterity. To plow it under later than that is idle. It will take hard work to exterminate the pest. If raked with a reaper some seed will surely be left to perpetuate the curse. Burning will not effect a complete eradication. Cultivating corn, potatoes and other root crops serves to wipe it out if thorough work is done.

Bulletins bearing on the subject of the Russian thistle are No. 31 of the University of Nebraska at Lincoln, and No. 15 of the Division of Botany, United States Department of Agriculture, Washington, D. C. Either of these bulletins will be sent free to applicants.

A Drouth-Resisting Fodder Plant.—Californians are experimenting with a new fodder plant known as the "Saghalién Knotweed" (*Polygonum Saghaliense*), plants of which are now growing on the experimental station grounds at Berkeley, and said to be wonderfully resistant to the effects of drouth. The following description is from the official journal of the Cape Colony Agricultural Department: "In climates exposed to drouths this *Polygonum* grows with astonishing vigor. Its roots accommodate themselves to all soils, even such as are hard and stony. Besides, it is used successfully to consolidate the banks of rivers, the slopes of railway embankments, and like places. It is a very picturesque plant for ornamental planting; the stems being about three feet high, furrowed like those of the rush, and the leaves numerous, about 11 inches long and $7\frac{1}{2}$ inches broad. The flowers are produced in panicles of little bunches, and are eagerly visited by bees toward the end of summer. On the approach of the European winter the stems lie down, but the root-stock is perennial under the surface. It requires no protection, and in the following spring new shoots arise more numerous than the previous year on account of the plant's facility of bud production.

In turning this plant to account as a successful fodder, the stems are cut in spring level with the soil as soon as they have reached a height of three feet or more. The entire cutting is passed over to the farm stock, which are all very fond of it, whether fresh or made into hay. New stems begin to sprout up immediately and furnish a second, followed by a third and even a fourth cutting in good soils, which keep up a prolonged vegetation. Under these conditions a clever cultivator could secure a return of about twenty-five tons per acre. A plantation is made

by picking out young plants obtained from seed, or sections of the rhizome, at a distance of a yard apart. A combination of the two is most suitable. This is best done in spring or late autumn. The next season the stems and leaves spread over the entire surface of the soil. It is not necessary to give any manure or culture when the plant is once established. It may be added that the young leaves make a very good vegetable for the table, less acid than sorrel, less insipid than spinach. The vegetarians have already used and appreciated it as a summer vegetable.

The Best Grain for Horses.—Most farmers in the central West and in the Southern States habitually feed their work horses and mules with corn. Oats to a certain extent serve to vary the diet somewhat, but the staple grain ration is corn, usually fed unshelled from the cob. A certain number of ears of corn are served to the animal, which is expected to bite the grains from the cob and consume the ration in his own way. While corn thus served has generally been regarded a cheap and hearty food, it is questionable if it is by any means the best food for work animals, especially in warm weather.

Street railway companies using horses as motive power long since learned that horses fed too exclusively on corn are short lived in their service, from the tenderness of the feet induced by the too-stimulating and feverish nature of the corn ration. Buyers for such service on a large scale therefore avoid, so far as possible, the corn-feeding districts or States, and endeavor to make their selections of animals from those parts of the country where corn is not regarded as the staple diet. For this reason Canada, where oats are generally fed, and California, where barley is the staple food for horses, have been drawn upon heavily for horses where endurance of hoof and muscular fiber are especially required.

Now that the price of wheat is very low as compared with both corn and oats, it should be largely utilized as a food for horses. Especially should wheat bran be made to do duty in the ration for work horses in place of corn. It is well known that wheat bran is rich in phosphoric acid, and that it may be used with great advantage to build up and sustain the waste of muscle and bone alike in the horse that works. While wheat in any form should not perhaps be used exclusively as a food, yet a judicious mixture of wheat bran with other forms of food daily, will be found of great advantage in preserving the health as well as the strength and general well being of work horses.

But barley is an excellent food for horses of nearly all ages and conditions, and the wonderful feats so often performed by California horses are often attributed to a life-long diet of barley, both as grain and hay. Practically no timothy or red clover hay is used

in that State, and while alfalfa is used to a considerable extent, yet the great bulk of hay consumed, especially by work animals, is made from barley or wheat, cut before the grain hardens and cured as other hay is cured elsewhere.

Be your own Grocer and Butcher.—Nothing is of greater importance to the man established upon a tract of irrigated land than is the matter of producing, as nearly as possible, what is consumed upon the family table. The more nearly the modern irrigator can approach to the traditional independence of the old-time farmer the better. It is something well worth striving for and will do very much to give to the occupation of cultivating the soil the dignity and standing it deserves. It should be a matter of constant study with the practical irrigator to so order and arrange his farming operations as to decrease his cash outlay to a minimum by producing a wholesome, abundant and sufficiently varied food supply for home use. No one can come so near doing this successfully as can the practical man who controls a few acres of decent land and an adequate water supply and he ought to do it. It will pay.

Increase Potato Acreage.—It is a remarkable fact that while American farmers cultivated over thirty-four million acres in wheat last year, which yielded but eleven bushels to the acre, worth 53.8 cents per bushel at the farm, and while the equivalent of over 180,000,000 bushels of that crop were sold in European markets, yet the farmers are still importing potatoes, while the farm value of the wheat crop of 1893 was but \$6.16 per acre, that of the potato crop for the same year was over \$41. The imports of potatoes for the ten months ending with April last, were 1,980,303 bushels, valued at ports of export at \$853,054; while for the ten months ending with April, 1893, the amount of potatoes imported reached 3,446,482 bushels, valued at \$1,607,191.

It can be thus seen that the acreage devoted to potatoes in the United States, may be extended somewhat with profit, while the wheat acreage certainly should be curtailed very considerably. By raising no potatoes for export, the duty on foreign tubers becomes operative and raises the price, not only of the potatoes imported, but also of the entire crop in the United States remaining unconsumed when importations are made.

A Kansas Enterprise.—The people of a township in Finney county, Kansas, whose land lies high and dry and is cut off from the possibility of securing water from the Arkansas river, the only stream in the vicinity, by an impassable range of sand hills, have under consideration the formation of an irrigation district on a novel plan. The Kansas irrigation law

provides for the formation of irrigation districts and the issue of bonds thereby to construct irrigation works. The people in question are scattered over an area six miles square. What they propose to do is to select a single section of land centrally located, lay it off in small tracts, reserving plenty of ground for public parks, etc., and all the people in the district move to this section, the proceeds of the bonds of the district being used to put in a pumping plant and build a reservoir large enough to irrigate the small tracts settled upon. Thus they will be enabled to enjoy the advantages of irrigated land, a good school and social privileges, using their scattered, dry farms to grow such grain and fodder crops as they may produce. The plan is excellent if properly carried out.

The Best Farm Horse.—For farm work the best horse, other things being equal, is the one that walks most rapidly. As an all-around work animal for the farm no gait compares with a rapid walk. The trotter and the running horse are of comparatively little worth on the farm, but the fast walker is invaluable. The horse that moves off with a firm, confident and rapid walk will do more work and do it more easily than any other animal. Entirely too little attention is paid to breeding fast walkers by farmers, as a class. If any special attention is given to the matter at all, it is generally in the direction of strength and weight, or in that of the fast trotter. With the better roads of the near future and with the light, improved agricultural implements, neither the heavy draft horse nor the trotter will have any proper place upon the small, irrigated farm. A horse of reasonable weight, but not so heavy as to be clumsy, and which has a rapid, vigorous walk, will be the horse to meet most completely the needs of the irrigation farmer especially. And the proper feed for such horses will not be corn in the ear, but oats or barley, with a judicious ration of wheat bran or other similar substances, and good sweet clover or barley hay. And the men who own such horses will see to it that they always earn their keep and a good deal more; in short, such horses will never be allowed to "eat their heads off."

An Indiana Irrigator.—As an object lesson in irrigation, on a small scale, the experience of Mr. W. W. Warner, of Marshall county, Indiana, may be of interest to farmers in the Mississippi Valley States who think their lands do not require irrigation. It may be said that Marshall county is in the northern central part of the State, and enjoys as great a rainfall perhaps as any part of Indiana. Still Mr. Warner found it very profitable to irrigate two acres of his land from a reservoir fed by springs.

The fertilizers used were such as were produced on the farm, and the soil was not of extra quality. The work was performed by the usual farm help, and Mr.

Warner gives to the *Indiana Farmer* the following statement of the product of the two acres referred to: He produced 415 bushels of onions, which sold for \$332.27; celery to the value of \$645.43; cabbage, \$60; making a total cash return, after paying freight charges on shipments, of \$1,037.70. The labor cost was less than \$45, thus leaving a net return of nearly \$500 per acre from his little patch of land properly treated. It is entirely safe to say that there are many farms in Marshall county, and in all other counties in the United States, containing 160 acres each, from which much less money is annually received than Mr. Warner received from his irrigated "farm" of two acres.

Good Roads being one of the greatest concomitants—a sort of twin-sister interest—of irrigation development, every irrigator ought to make it a matter of personal care and pride not to allow the water to escape to highways or sidewalks while irrigating. To do so shows a slovenly or careless bent in the farmer, wastes good water which ought to be devoted to better purposes, and has a tendency to draw from passers-by uncomplimentary and untidy remarks, thus unduly adding to the burdens of the clerical force in the office of the recording angel. As a matter of fact, we shall not be surprised to find that the man who carelessly allows water to flood a public highway has charged up to his private account all the sinfulness occasioned thereby, and it would serve him right.

A Potato Fertilizer.—An experienced potato grower recommends as the best fertilizer, if the crop is planted on a sandy loam (the most suitable for potatoes) the following: Sulphate of ammonia, 105 pounds; muriate of potash, 225 pounds, and superphosphate, 85 pounds. This amount of the ingredients named applied to an acre of potatoes has been known to double the ordinary yield, and can generally be depended upon to very largely increase not only the yield but the quality of the tubers.

Those who have given but little attention to fertilizers, as is very likely to be the case with farmers in the arid belt, will be surprised at the increased yield of a better quality that almost invariably follows a fairly liberal application of suitable fertilizers to the growing crop. All plants require for their growth and maturity definite quantities of nitrogen, phosphoric acid and potash; and if a soil is deficient in any one or more of these necessary ingredients, it will be impossible to mature a full crop, even though the other ingredients be present in excess. The strength of a chain is that of its weakest link; and the strength of a soil may be fairly estimated by the bulk of the above named ingredients which it contains.

Profit in Alfalfa.—Irrigated alfalfa fields in parts of the arid west last season paid net profits of upward of \$30 per acre. At least such are the figures, upheld by the statements of dozens of as good, reputable, reliable men as can be found anywhere, and they stand ready to back up their statements by sworn testimony. This was on land which was not worth more than \$15 per acre as raw land, and would not have been worth one-tenth that amount but for the value given by good location. Alfalfa can be set at an average expense, in some localities at least, of not more than \$6 per acre, and in many instances a good stand has been obtained at less than \$5 per acre from the sod. Given fifteen-dollar land, and add \$5 per acre to seed it to alfalfa, making a total of \$20 per acre, and it is small wonder that with such results as above mentioned there should be a rapid increase in the acreage of alfalfa in many sections.

Keep Abreast the Times.—Nothing shows the unreasoning conservatism which seems to largely dominate reasoning humanity more strongly than the persistence with which thousands of farmers will, year after year, grow crops and stock, or follow methods of farming, which have ceased to pay and which an intelligent study of conditions would show must continue, for a time at least, to be unprofitable. Farmers must learn to watch the course of business and production closely.

Lucerne.—Utah Experiment Station bulletin No. 31, just issued, reports experiments on the time of cutting lucerne, and on mulching. As to the proper time of cutting lucerne, the results given are timely and interesting. It is shown that, whether cut twice or thrice, the yield is practically the same. The weights are given for each cutting, also the dates of cutting. The principal feature of the trial, however, was the feeding of steers to test the relative feeding value of lucerne cut at different degrees of ripeness. The first cutting was done before the lucerne came into bloom, the second lot in early bloom, and the third lot completely out of bloom. In the feeding trial the "early cut" lucerne gave a gain per day per steer of .778 pounds; "medium cut," .234, and "late cut," .328. On the second crop, "early cut" gave a gain of .743; "medium cut," .751, and "late cut" .169. Taking the average of the first and second crops, it is seen that early cutting gave decidedly the best results. It is believed, however, that conclusions should be suspended until further experiments verify the results of this. The bulletin is summarized as follows:

1. Early-cut lucerne gave a greater gain than late-cut lucerne.

2. As large a crop was received from two cuttings as from three, whether the first cutting was at an early period or at a medium period of its growth.

3. As early-cut hay gave a slightly better gain, the balance of the experiment favors early cutting.

4. It is assumed, not known, that the character of the growth from early-cut lucerne would not be as substantial as from the late cut.

In the mulching trial, reported in the same bulletin, no good results are shown to come from mulching. In fact, there is a decrease in yield shown in almost every instance where mulch was applied. The statement is made that the trial was conducted on a very poor piece of ground, and that it will be transferred to a more favorable area of the farm.

Utah Experiment Station bulletin No. 32, also just received, is entitled "Roots and Plants of Farm Crops." The weights of roots of oats, clover, corn, potatoes, timothy, barley, wheat, at each inch of depth down to twelve inches deep are given, and then the total weights for the twelve inches. A very accurate method was pursued in gathering the roots. The soil was a sandy loam, upper bench, and several feet deep at the point tried to the cemented limey sub-soil filtered into gravel.

The same bulletin contains a table showing the number of plants and stalks of farm crops per acre and per square foot taken from four plats and averaged, the crops being oats, barley, spring wheat, fall wheat, rye and clover. The bulletin is interesting and valuable for reference.

INFORMATION WANTED.

A READER of THE AGE desires other readers who have the knowledge to tell him all about the "midge" or "louse" which is doing, or seems to be doing, so much damage to alfalfa in portions of the Arkansas Valley this year. It is a minute winged insect; is about a sixteenth of an inch in length but is narrow as the finest mark made by a fine-pointed pen, hence can only be seen by close searching. It is supposed to suck the juices from the blossoms of the alfalfa, causing them to wither and drop off, thus curtailing the seed crop. What is the insect? What is its life history? What actual damage does it do, and what measures can be successfully adopted to destroy it?

It is also desired to know the name and nature of a slender, bright yellow vine which has appeared in some western alfalfa fields, which spins its filaments from plant to plant like a huge, golden-colored spider's web. Is it a dangerous pest? What can be done to check its spread and destroy it? It is suggested that some of our German readers who grew alfalfa (or "luzern") in the old country tell our inquirer about this parasite, what damage, if any, it did in alfalfa fields there, and what steps were taken by people and government to get rid of it.

HORTICULTURE BY IRRIGATION.

CASTOR BEANS AS AN INTERCULTURE.

BY W. C. FITZSIMMONS.

A CORRESPONDENT at Sterling, Illinois, sends the following letter relative to a subject which has a considerable importance to almost every fruit grower who plants an orchard in any part of the country:

LETTER OF INQUIRY.

"Myself and several friends expect to locate in the fruit section of the Snake River or Yakima River valleys and engage in fruit raising. I have been looking around for some time for the best crop to raise for a few years until our trees come into bearing, and it occurred to me that perhaps the castor bean would be as profitable as anything. Could you not give the AGE readers some information about its culture, yield, prices and market, manner of harvesting and the adaptability of it to the arid regions of Idaho and Washington?"

"They are quoted in St. Louis at \$1.25 per bushel, and I have been informed they would yield 50 to 100 bushels per acre, with good care and cultivation, and are not much more work than corn. If that is correct they would certainly be a very profitable crop to raise."

Although not distinctly stated with above communication, it may be assumed that reference is made to a crop to be grown between the orchard rows. In the first place, if it be determined to utilize the space between trees while awaiting their fruition, a crop should be selected, if possible, which is adapted to the conditions of the locality and which gives promise of profitable returns.

THE ORCHARD THE MAIN OBJECT.

The soil and climate of the regions referred to are so exceptional that a great number of crops may be successfully produced there if cultivated by themselves alone. But the main consideration, after all, is the pushing of the orchard to maturity as rapidly as is consistent with its own welfare; hence such crops should be chosen to plant among the trees as will interfere as little as possible with the orchard growth and development. Above all things trees must not be deprived of the sun; hence any crop growing to a height necessarily making much shade possible upon the fruit trees should not be thought of. To be sure, it is well for the first year or two after planting to screen the tree trunk from the direct rays of a hot sun, yet this may be done much better by

[This letter of inquiry was sent to Mr. Fitzsimmons to be answered, he being an authority on the subject.—EDITOR.]

wrapping with newspapers or coarse burlaps and fastening carefully but not too tightly. For this reason, besides others to follow, we cannot recommend castor beans as a suitable crop to be grown between rows of young orchard trees. For the same reason corn is not a proper crop to be thus grown, although it is sometimes so planted.

RESULTS IN KANSAS.

A few years ago the writer undertook a somewhat careful investigation of the profits and other conditions of castor bean culture as shown in one of the best districts to be found in the United States, namely southeastern Kansas. The country there appeared to be well adapted to the crop, and a considerable acreage had been cultivated for several years. A recent trip through the same district showed a greatly lessened acreage growing than formerly. The figures of yield and price given by our correspondent would indicate a good business; but unfortunately no such actual profits can be relied upon. Thirty bushels of beans per acre would probably be found to be a good average yield, and quite likely the real figures would be considerably below that point. Then, too, the castor bean is not a sure crop, one year with another, though in this regard perhaps it is not more hazardous than many others. The net result, however, if the investigations referred to, which were conducted at considerable pains and expense, was that a gross return of \$25 to \$35 per acre, appeared to be about all there was in the castor bean business at that time and place. There are no general statistics available showing the profits of the castor bean industry as a whole in the country, but observations covering some years lead us to believe that the figures made above approximately represent the probabilities of that business in tried localities. In localities not yet tested on a large scale, as in the Yakima region, it is not possible to speak with authority.

POTATOES RECOMMENDED.

On the other hand, we can recommend potatoes for that valley, either as an interculture or to be cultivated in the open. This crop requires the land to be kept in good condition, does not interfere with the growth of trees in any manner detrimental to them, and if properly cultivated and fertilized will rather add to otherwise favorable conditions for the growth of an orchard. With plenty of irrigating water and with

careful culture the rows of potatoes may be placed near each other, though they should not be within, say four feet of the newly planted trees; and thus a good crop assured in ordinary seasons. Frost may sometimes hurt a crop, but with irrigating facilities one good crop may be practically assured; in some cases two crops might be grown in one year by proper care.

Relative to the probable outcome of a potato crop, we have full and reliable statistics for almost the entire country. By the census of 1890 it is shown that the average yield of potatoes for the whole United States for a period of ten years was 76.2 bushels per acre per year, worth at the farm \$38.34. It will be at once seen that taking so long a period and so wide an area as was embraced in the report, the potato crop has been one of the most profitable grown by farmers. In fact, it is so now, and bids fair to so continue to be for some time to come. But the census figures show still more. They show that the average yield of potatoes in Washington for the ten years, 1880 to 1889 inclusive, was 117 bushels per acre, the greatest given for any State or Territory. The next highest yields were those of Montana, 107.4 bushels, and Oregon, 100 bushels per acre. The farm value of the potato crop of Washington during that period was \$54.91, or \$16.57 more than the average for the country at large.

In view of all the known and unknown conditions affecting the queries of our correspondent, it is quite safe to recommend potatoes as an interculture among new orchards in the Yakima region. In fact, there is no better potato region in the world than that. Next to potatoes, we should recommend an investigation of peanuts for the same purpose. There is just now something of a peanut "boom" in various parts of the country, and some allowance must be made for excited imaginations among the most enthusiastic advocates of peanut culture. This is, however, a crop not fully tried on a large scale in the region under review, and plantings should be experimental and comparatively small at first. Cabbages are often grown with good profit among orchards and can be shipped long distances with satisfactory results.

To conclude, we cannot recommend castor beans as an orchard crop, but believe that with careful culture any of the other crops named can be made to yield reasonable profits while interfering very little with the growth and early maturity of the orchard. In planting any crop among orchard trees, care should be taken not to encroach too much upon the legitimate domain of the trees themselves. After the second year it will be found that their roots have reached out to a considerable distance, and if encroached upon by other crops, enough fertilizing material should be applied to give both trees and other

crops sufficient nourishment. Even if the land be new and rich, both trees and other crops will be found to appreciate a ration of fertilizer.

As a further practical suggestion, to be considered in connection with the foregoing, we quote the following from *The Ranch*, published at North Yakima, Washington:

"No reason in the world why the turkey ranch will not pay in this dry country. Few are the springs when the rains or the dews will chill the young. In summer the grasshoppers are plentiful and there is an abundance of range. They can be herded like sheep and driven home at night. The sage brush gives shade, and when well along the young turkeys can be allowed to get their drink from the irrigation ditches."

MARKETING THE ORANGE CROP.

BY W. C. FITZSIMMONS.

ONE of the benefits of concentration and coöperation in marketing crops, is shown in the case of the Florida Fruit Exchange. The promiscuous consigning of Florida oranges by individual growers and shippers inevitably led to the glutting at times of every market, thus depressing prices below the point of profitable production. As a partial remedy for this great evil, the Florida Fruit Exchange has proven of immense advantage, not only to the men who have sold their fruits through its efficient agency, but the steadiness of the markets, largely brought about through the action of the Exchange by its intelligent distribution of shipments to many consuming centers, has resulted in better prices for all Florida fruit.

While the past season has been one of unprecedented depression in nearly all lines of business, and in spite of the fact that the orange crop of Florida was the largest ever grown, the Exchange prices for fruit marketed through its agency were reasonably satisfactory. At a late meeting of the Exchange the report of the manager showed that the amount of fruit handled by this agency for the season was 456,119 packages, an increase of about 25 per cent. over the preceding year's business. The total gross average price per box for oranges was \$1.75, and the net price at shippers' stations was \$1.02 per box. The gross average price received for pineapples was \$4.93 per crate, and the net average was \$3.16.

Besides acting as a reasonably successful selling agency, the Florida organization fought to a triumphant finish the contest between fruit shippers and the railway companies concerning an increase of freight charges by the latter. The result of this contest before the Inter-state Commerce Commission was a saving of about \$115,000 in transportation charges alone on the last season's crop. Further proceedings are to be had also with a view to collecting from the transportation companies the excess paid

by shippers prior to the injunction against raising the rate.

It will thus be seen that while the Florida Exchange has been of very great advantage to many orange growers in the State, it has been of even higher advantage probably as an object lesson to the whole country, showing the beneficial results of coöperative effort along the lines of rural industry, especially in marketing the products of the soil. In fact, the Florida Fruit Exchange has demonstrated beyond a question the pre-eminent benefits of coöperation among fruit producers and shippers.

To a very great extent the same may be said of the Southern California Fruit Exchange, organized last fall for the better marketing of the citrus fruit crops of that State. At this writing full data of the operations of the Exchange are not available, but partial reports of the management from time to time through the season show conclusively that the Exchange has been an agency of the greatest value in the distribution of the crop to the best available markets. So far as at present writing it may be stated, the net returns to growers who shipped through the California Exchange were about the same as those given above for Florida. And it is conceded by very many well informed growers that except for the Exchange the returns could not have been so favorable by a large percentage.

But the strange thing in connection with both the California and Florida Exchanges is that the orange growers in each State hesitate about joining their fortunes with their neighbors. Whether this results from selfishness, want of information, distrust of others, or from habitual indifference it is difficult to say; but the fact remains that not nearly all growers have as yet joined the Exchanges or any other coöperative association for marketing fruit in either State. The Florida organization is much older than that in California, and its operations have been generally conceded to have been honest and efficient; yet men still hesitate to patronize it, and send their fruit promiscuously to commission houses in the North who make such returns as they please. The same is true in California; but the indications now are that in both States a more enlightened policy will be hereafter adopted by growers generally, and this means full, complete and permanent coöperation.

THE LEMONS OF THE UNITED STATES.

FLORIDA lemon growers assert that the fruit produced in that State, under the best conditions of cultivation and curing, far surpass the imported fruit, and weigh about fifteen pounds per box more than that usually brought from Italy or Spain. That lemons of the finest quality are produced in considerable quantities both in Florida and California there is no

doubt whatever. And the problem of producing in those States all the lemons required by the people of the United States is merely one of suitable climatic conditions and skill in curing the fruit for market.

Some two or three years ago careful tests were made under the direction of officials of the Department of Agriculture, and it was then ascertained that the lemons tested, which were grown at Riverside, California, fulfilled every possible requirement and were pronounced far superior in nearly all respects to the best imported lemons to be found in the markets of Washington. Doubtless those grown under the best conditions in Florida would be found to possess most if not all the desirable qualities found in the California fruit. The lemon trees and fruit are less hardy than the orange, hence require a mild winter temperature unless it happens that the fruit in the locality will mature nearly at the same time, and before the approach of winter. Ordinarily, however, the lemon tree matures its fruit continuously, and therefore it is generally important that the mercury should never go below 32° for best results. While a temperature of 32° may not seriously damage a lemon crop provided the mercury does not remain long at that point, yet if an orchard site can be selected where the thermometer always registers above the freezing point it will, other conditions being equal, enjoy very great advantages over one where the mercury goes below 32°. The tenderness of the lemon of course necessarily restricts possible plantings to the milder sections of the more southern States of the Union. And even in the southernmost sections, if far removed from the sea, lemon culture is quite uncertain, if not impossible, by reason of extremes of temperature. The greatest care should therefore be exercised in selecting a site for a lemon orchard.

The prime consideration, however, is to find a place as nearly frostless as possible, for there are very few "frostless belts" in the United States, although the real estate boomers advertise large areas under that seductive title. The site once selected, the trees should be of the best budded varieties, and among them the Lisbon, Eureka and Villa Franca are standard sorts and have many of the best qualities to be found in lemons anywhere. The Villa Franca is alleged to be more hardy than trees of most other varieties. The trees should have been budded upon orange stock, and if upon the wild orange it is just as well, possibly better. Experience has not yet fully demonstrated which is best for lemons, the sour or sweet orange stock. But in no case should lemon trees budded upon lemon or lime stock be used. The spreading habit of the lemon tree would suggest a distance of at least twenty-four feet between trees, and an orchard planted as here suggested will scarcely fail to give you returns if properly cultivated, watered and fertilized.

Forest Tree Planting.—In the absence of strictly enforced laws and regulations to protect the American forests from wanton destruction by fire and by lumbermen, it can scarcely be hoped that in the present generation at least this reckless waste can be wholly repaired. It may, however, be reasonably hoped that farmers in the arid belt will so readily understand the vast importance and direct benefits of large timber areas in any agricultural section that they will encourage tree planting wherever feasible. To many it may seem a hopeless undertaking to plant forest trees with any prospect of seeing value in them during the lifetime of the planter.

But, nevertheless, trees should be everywhere planted among the farms and along the roadsides throughout the arid regions, and until their rapid growth is actually seen and recorded one can scarcely comprehend it. To be sure, some varieties grow much more rapidly than others, but perhaps the more rapid growers are not always the most desirable or profitable to plant. The cottonwood is often planted along irrigating ditches and in moist ground, but it is by no means the best tree to plant in such places. The cottonwood has little commercial value, although it is sometimes used for fencing and other purposes about the farm. A much more useful tree, and one which will grow almost anywhere within the climatic limit of possibility, is the common eucalyptus or blue gum. The timber of this tree is valuable, it grows very rapidly and roots deeply. It will often flourish where other less valuable trees will fail. Extremely cold weather would destroy the eucalyptus, however, and its planting should be confined to the more temperate regions of the arid belt. This tree does not, like the cottonwood, furnish a breeding ground for insect pests, but on the contrary is alleged to act as a repellent of the whole tribe of noxious insects that invests every kind of plant life in all countries.

Among the better known varieties of native forest trees which may be planted with reasonable hope of early results is the "shell bark" hickory. When properly planted in rows and cultivated, watered and tended, the hickory makes rapid growth and soon attains a size adapting it to coopers' use for hoops, while a few more years' growth will convert it into tool-handle timber. By planting the hickory in rows six feet apart, and four feet apart in the rows, about 1,700 trees may be grown upon an acre of land. By gradually and carefully thinning out the rows as the trees attain a salable size, it will be found that in a few years such a timber grove has attained very great value. It is well known that the carriage makers find it more and more difficult each year to secure a supply of hickory timber for their uses, and pay very attractive prices for satisfactory material of that character. In suitable places, too, white ash may be

planted with profitable results, though perhaps with less satisfaction than the hickory. Black walnut will grow in nearly every county in the arid belt, if surrounded by conditions attainable in nearly all parts. From the fact, however, that the hickory may be utilized at almost all stages of its growth, it is probable that it would yield the best results, even if planted on a large scale, when properly cared for.

Probably no more profitable investment could be made anywhere in the irrigable domain than the planting of large areas of timber of the varieties best suited to local conditions, always considering the commercial value of the timber itself as well as its incidental value for shade, windbreaks or fuel.

An Opening for a Young Man.—Since spraying the orchard is a necessity in order to produce merchantable fruit on a large scale in all parts of the country, preparations to treat the trees in a proper manner should be made by all owners of orchards, even though small. In a district where fruit growing is merely a side issue, and quite subordinate to the general farming interest, it may be inconvenient and perhaps expensive for each farmer to maintain an efficient spraying outfit. In such cases it will generally be found that by the farmers of a neighborhood clubbing together, a spraying outfit sufficient for the use of all may be obtained at a small cost to each, and that the work may thus be done for all at no great expense.

What would be still better, however, would be to offer adequate inducements to some enterprising young man in the neighborhood to provide himself with the necessary spraying apparatus and materials for the required sprays, and then to do the work for each orchardist as required, at a cost to be agreed upon. In this way the work would almost certainly be done when needed, and would not be indefinitely postponed, or indifferently performed, as is so liable to be the case when the small orchardist depends wholly upon himself to provide the appliances and materials for spraying.

Peanuts.—In the cultivation of peanuts the main points are to keep them clear of weeds and grass; do not hill the spreading varieties; let them lie flat on the ground; and keep throwing fresh dirt under the ends of the creeping kind as they grow outward, so the young nuts can easily bury themselves. Keep the ground loose and mellow around the roots.

Why Not Have a Fall Garden?—Is it necessary that the one effort in the spring should be all the attention given the garden, when by a little forethought you can have the health-giving fruits and vegetables the entire year?

ELECTRICITY AND WATER POWER.

ELECTRICITY AND WESTERN DEVELOPMENT.

BY AN ELECTRICAL ENGINEER.

From the Northwest Magazine.

THE knowledge has not reached the American people that there is a section of country in the United States destined in the near future to become the theatre of an industrial revolution greater than any precedent in the world's history. The cause is the creation of electric light, heat and power by the utilization of falling water. The section to which allusion is made consists of the States of Washington, Oregon, Montana, Idaho, California, Wyoming, Nevada, Colorado, Utah and the Territories of Arizona and New Mexico, with an area aggregating 1,175,490 square miles, which will be designated here as the Western section, in distinction to the geographical divisions comprising the States and Territories on the east of it, and extending to the Atlantic Ocean, containing altogether 1,794,510 square miles, to be known as the Eastern section. It will be noticed that, contrary to popular impression, the Western section nearly approaches in size its Eastern neighbor, and, as investigation will show, possesses a capacity for useful production far beyond that of any corresponding portion of the earth's surface.

Except in favored localities in the East, the Western section holds a monopoly in its unlimited water power. When thus produced electricity can be utilized to turn night into day. It will banish at once gas works, cooking stoves, heating furnaces, chimneys and smoke. It will abolish boilers, engines, coal and ashes. It means an uncontaminated atmosphere and freedom from damage to goods and fabrics. However great and far-reaching may be the industrial changes likely to ensue as the result of relatively free light, heat and power, they are small in importance compared to the wealth of natural resources in the West which such changes will introduce to the activities and ambitions of the world's inhabitants.

Dividing the elevated mountain ranges are basins varying in size which for centuries have been the receptacles of the wash of the mountains, the soil thus made being really a combination of chemicals best suited for plant growth, which in the upheaval of the surface was lifted from the bowels of the earth and through ages of exposure to the air and elements made ready for the intended purpose. Every valley has abundant water supply in streams which head among the mountains and are fed by the congealed accumulations of the previous winter, slowly melting

as the sun gains strength and the supply naturally and automatically regulated, so that the same heat that in the valleys demands moisture for the crops unloosens it on the mountain sides to meet such requirement. Some of this water, after absorbing ammonia and other valuable qualities from the atmosphere, runs on the surface in rivulets and streams directly to replenish the fields below, while much of it sinks into the earth to gain by percolation soluble richness from the volcanic matter and decomposed limestone of which the mountains are composed, only to reappear in springs at lower levels to join the common stream. With rare exceptions the lands of the valleys have exactly the requisite degree of slope to insure an even flow of water over the surface, and the streams run at such a grade that canals for irrigation can be economically constructed to carry supplies out to contiguous cultivated fields.

It will thus be seen that the operations of the agriculturist are carried on with the certainty of maximum results. He has all the forces of nature under absolute control, and can in the beginning of a season, with the knowledge of the character of his soil and his facilities for water supply, calculate with a certainty precisely what the yield will be at the termination. Starting with a soil as rich as nature can make it, with seasons arranged as if for his special use, with rain quietly stored in neighboring mountain heights to come at his bidding, instead of precipitating itself, frequently with dangerous violence, at unwelcome seasons, with reservoirs of liquid manure needing only to be tapped, with a climate constantly inviting out-door labor, and with no uncomfortable heat or cold to encounter—what conditions supposed to have existed in the Garden of Eden are lacking in this? But the list of attractions of the mountain States is not yet complete. There being no moisture permanently in the ground there are no long waits in the spring for the melting of the frost before the labor of plowing and seeding can commence, and for the same reason all traveled roads are as perfect as any combination of material can make them.

In contemplation of the possibilities of such a country who can predict its future, when with wise laws capital can be provided for the stimulation of its resources? What a magnificent field for the settlement of the idle millions of the over-crowded East if knowledge of the inducements for emigration can be conveyed! Electricity will here find its home and its benefits be so diffused that the modest farm-house as well as the city mansion may enjoy the blessings of unlimited light, heat and power.

PULSE OF THE IRRIGATION INDUSTRY.

IRRIGATION IN CENTRAL WYOMING.

BY ARTHUR W. PHILLIPS.

IRRIGATION enterprise is awakening at a rapid rate in Central Wyoming this year; several large and very promising projects for utilizing the abundant waters of the North Platte river have been started and are well under headway at the present time. The triumphant success of the Harvey water-

a fine large body of land on the old Fetterman reservation.

The "Riverside Canal Company" has been lately formed for the purpose of irrigating the rich bottom lands along the river between Douglas and Orin Junction. Their scheme involves the constructing of a large water power plant, and pumping the water into their canals. The place where they contemplate



NORTH PLATTE RIVER AT LOWEST WATER, SEPTEMBER.

wheel, which was described and illustrated in *THE AGE* of June, this year, has opened people's eyes to the vast possibilities of the splendid valley through which the noble Platte, deriving its supply from countless mountain springs and streams, and melted snow from lofty mountain ranges, winds its way for a distance of over 200 miles in the State of Wyoming, carrying a volume of water amounting to 15,000 cubic feet per second of time.

The "Fetterman Ditch Company," recently organized, are working a number of teams on their ditch above Douglas, and will construct a ditch to irrigate

building the waterwheels is admirably adapted to such an undertaking, being a narrow channel between two rocky banks, where the fall in the river is very great. The development of an immense power is comparatively easy and cheap at this point, and when power is obtained it is an easy matter to raise all the water required to a height of twenty-five or thirty feet.

THE PLATTE VALLEY.

The irrigation of the Platte valley by this means can be accomplished at a small outlay per acre, and the splendid water supply in the Platte insures abundance of water at all times and for all purposes.

The tract of country intended to be reclaimed by this company is especially valuable. The land itself is fine in quality and in its formation. Sloping gently from the foothills to the river, it affords every facility for thorough irrigation with good drainage, which is so essential to successful farming by irrigation. A large portion of this tract of land is already settled upon by a thrifty and good class of people, who will be glad to purchase water from this company to make their lands productive. Most of these farms are well improved, with fine buildings and good fences on them. All these lands are adjacent to the Fremont, Elkhorn and Missouri Valley Railroad, which makes a junction with the Denver and Gulf Railroad at Orin

practically inexhaustible, and the cost of constructing the irrigation works reasonable.

One of the principal promoters of this enterprise is the Hon. DeForest Richards, State Senator from Converse County, and President of the First National Bank at Douglas, Wyoming. Mr. Richards has had extensive experience in irrigation matters in Wyoming, and is convinced of the soundness of this enterprise and of its ultimate success.

CLIMATE AND PRODUCTS.

There is no finer climate on earth than in Central Wyoming. The altitude is high enough to make the summers pleasant, but not so high but what alfalfa, corn, tomatoes and other such crops mature and



FARM BUILDINGS ON THE LINE OF THE RIVERSIDE CANAL, CENTRAL WYOMING.

Junction. At this point this company will have their canal high above the town, affording facilities for using the immense water power to be obtained from a fall of twenty feet from the canal, which can be used for operating mills, electric light plant, etc. A pipe line is now under construction from the oil fields at Casper to Orin Junction, where the oil will be shipped on the cars south. When this is completed it will make Orin Junction a lively place.

There is no ditch enterprise in the West that has better prospects of success in their undertaking than this one. The land is excellent farming land, the location is all that can be desired, every acre of the 10,000 acres being near two railroads, the water supply

flourish. The farmers, therefore, who have located in the Platte valley, and have succeeded in irrigating their farms, are the most prosperous of any of the people in the State. The market for produce of all kinds can never be glutted, for the reason that the land capable of being cultivated in Wyoming is only about four per cent. of the total area of the State, and the uplands will always be used for the grazing of vast herds of cattle and sheep, which consume in being fattened for market all the produce that can be raised.

As an example of the fertility of lands in Wyoming we can take some crops which have been harvested in the State in recent years. The premium presented

by the *American Agriculturist* for the best and largest yield of potatoes in the United States was awarded to Wyoming for a yield of 975 bushels off one measured acre. There is also on record a yield of oats of 131 bushels per acre, and a crop of wheat that threshed out 67 bushels to the acre. Such yields are exceptional of course, but there is no reason why the same care that brought them about once should not be equally as successful again. Wyoming gained the first premium for wheat at the World's Fair in competition with the whole world.

In area Wyoming is an empire, larger than the whole of New England, containing boundless resources. In agricultural lands she has homes for millions, and in minerals of all kinds no State in the Union is her superior.

"MY BROTHER'S KEEPER."

To the Editor of THE IRRIGATION AGE:

THE stand taken by THE AGE in the June issue, wherein it states that "hereafter THE AGE will expose doubtful enterprises," is a grand step in the right direction and deserves the praise and practical support of all persons interested in the cause of irrigation. Herewith find \$2 for a year's subscription.

The position of THE AGE is doubtless taken after due consideration and the public need fear no "backsliding." The step should make THE AGE the most influential journal and best advertising medium for legitimate ventures in its line in America.

THE WRIGHT LAW.

The writer is a most enthusiastic believer in the cause of irrigation, and willing to do everything possible to advance its true interests, but has had the honor of being hung in effigy for opposing gross mismanagement, safely ensconced under the wings of the "Wright law" of California. Theoretically the "Wright law" is good, and in the line of coöperation by communities, practically it admits of fraud and manipulation in the interests of "promoters." I believe it is the duty of every good citizen to coöperate with THE AGE in exposing these defects and causing them to be remedied.

Two years ago I had written THE AGE calling attention to these matters, but was advised by those consulted that it would be useless to send it, as anything written against the management of an irrigation district would be construed as prejudicial to the cause of irrigation and would be suppressed. Your present attitude gives me hope a little judicious criticism will not be taken amiss, and that other districts may be protected against the snares into which this district has fallen.

THE AGE mentions "one district where schemers and manipulators have imperiled the fortunes of a community of honest, hard-working men." I suspect

you mean the Perris irrigation district, knowing its relations to the Bear Valley company and its dissensions of two years ago. It is to be sincerely hoped that no other community has been duped as this has been, but fortunately Perris irrigation district can and will survive its misfortunes, as its resources are great, its location desirable, and its advantages unsurpassed; besides, the bad management was exposed before many investors had bought at high prices, and the land which, under proper management, would be selling for \$150 and upward per acre is now being sold at from \$40 to \$60 per acre.

The locators and early settlers, who had borne the strain of pioneer life and who should have been benefited by the formation of the district and the introduction of Bear Valley water, are the sufferers and are now selling their land for a merely nominal sum to get money to meet taxes, buy water, and get started under the new regime. This state of things has been brought about by plausible persuasions before the district was formed and unwise management thereafter. The district is now being carefully, honestly and economically managed and has a good future to look forward to.

The object of this article is not to expose or denounce anyone, but to try to interest THE AGE in bringing about such legislation as shall prevent the abuses legally possible under the "Wright law" and other similar State laws.

THE AGE will certainly merit the best wishes of its constituents if it can succeed in protecting the honest home seeker, and the safe-investment seeker of small means, from the "velvet fingers of cunning."

The method which appears most feasible and direct to the writer is to have the next Irrigation Congress pass a resolution embodying the following ideas.

Resolved: That the legislature of each State be urged to establish a Commission (or have added to the duties of some Commission already formed, as the State Bank Commissioners) whose duty it shall be to annually investigate and report to the Attorney-General of the State, the legal, financial and industrial status of each irrigation district already formed, or which has taken steps toward such formation, and that said report be made public, and that no irrigation district be permitted to organize and issue bonds until their plans and possibilities are investigated and approved by said Irrigation Commission and the Attorney-General and Surveyor-General of the State. Said legislation being intended to equally protect from fraud the bond buyer and home seeker.

Hoping to interest in a just cause abler minds than mine, I leave the matter with THE AGE and its co-workers.

ORA OAK,
Perris, Riverside Co., Cal.

IRRIGATION IN CHINA.

A large part of the farming of the Chinese empire is done by irrigation, and the water rights of the Celestials are as full of complications as those of Colorado, says Frank G. Carpenter.

Although they have no fences to mark the boundaries of their property, they work away in peace and quiet, and it is wonderful how much they make the land produce. Three crops a year is not uncommon, and if a sign of failure is seen the seed for another crop is straightway sown.

The farms are remarkably small, thousands of holdings being an acre or less, and in the better part

A MEXICAN CANAL.

The Bureau of the American Republics, at Washington, D. C., is informed that the Sonora and Sinaloa Irrigation Co., which owns a concession granted in the name of Mr. Carlos Conant, for the construction of an irrigation canal in the States of Sonora and Sinaloa, is rapidly pushing forward its work. When completed the canal will be seventy feet wide at the bottom, having a fall of fifteen inches per mile, and will carry a stream of water six feet deep. For more than one year a steam dredge costing \$27,000 has been at work. The concessionaire has a land grant of 550,000 acres, lying between the rivers Yaqui and Mayo,



FARMING LAND IRRIGATED BY THE RIVERSIDE CANAL, CENTRAL WYOMING.

of the empire it is estimated that an acre will support a family of six persons.

The use of fertilizers is universal, and there is no land which is so well fed. Everything is saved, and the stuff which is gathered up is kept in great vats, and the farm is watered like a garden. A dipperful of the fertilizer from the vats, in liquid form, is put into every bucket of water and the mixture poured at the roots of the plants.

Such fertilization is going on all the time and sometimes \$20 to \$30 is spent on one acre.

The tools used are extremely crude, and there are no horses and few cattle, the plows, when the land is not worked by hand, being pulled by water buffaloes, an extremely ugly animal.

which will be opened to settlement as soon as the canal shall have been completed and the land subdivided.

In Owens Valley, Inyo County, California, the Californian Waterworks and Irrigation Co. is constructing a canal fifty-three feet wide on the bed to carry six feet of water. It will be about eighty miles long and will irrigate over 300,000 acres of land lying in the Owens Valley, Rose Springs Valley and Indian Wells Valley. About eighteen miles will probably be completed in October, when 170,000 inches of water from Owens River will be turned in.

Arizona canal building to the amount of \$8,000,000 is promised in the next six years.

The people of the south side of the Platte river in Scotts Bluff county, Nebraska, met in Gering during the middle of August and organized the Gering Canal Company, for the purpose of constructing a canal commencing in Wyoming about three miles west of the Nebraska State line, and building a ditch to the lower end of Creighton valley, in Scotts Bluff county, making the ditch about fifty miles long. Martin Gering, W. S. Peters, F. M. Sands, George Lawyer, E. P. Cromer, Wm. Bensley, Ed. W. Sayre, G. Dickenson and Frank Beers were elected directors, and George. H. Lawrence, engineer.

It is estimated that not less than twelve hundred irrigation pumping plants have been put into operation in the western half of Kansas the current year. This represents a good big practical step in the right direction and will produce valuable results.

The Lincoln (Neb.) *Call* says: "A little less politics, a great deal less talk on the silver question, and more, infinitely more, horse-sense discussion of the irrigation question."

At a late meeting of the Northwestern Nebraska Irrigation association a committee was appointed to correspond with other irrigation associations, boards of trade and others interested, to arrange for a meeting for the purpose of drafting a bill on the subject of irrigation which will cover the legal necessities of the entire State.

B. F. Williams of Douglas, Michigan, is putting in a pump to irrigate a fruit farm, obtaining the water from a creek near by.

Mr. G. M. Munger of Eureka, Kansas, is constructing an extensive irrigation plant to water about five hundred acres, principally orchard, in which the fruit trees are beginning to bear.

Kansas expects to have a display of her farm, field and orchard products, grown by irrigation, at the National Congress in Denver. It may be made permanent.

An Ellensburg, Washington, business man is fitting up a capacious room in which to keep a permanent exhibit of the products of Kittitas county. It is a laudable undertaking and public spirited in the highest degree.

The contract for the construction of the Middle Ditch, Yakima county, Washington, has been awarded to Peter Costello. The estimate of cost, as furnished by Engineer Owens of North Yakima, is \$136,748.10.

Scotts Bluff County, Nebraska, has over one hundred and fifty miles of ditches, which irrigate many thousands of acres.

Each of the three political parties in Kansas has an irrigation encouragement plank in its platform.

The only farms in Nebraska where crops did not burn are irrigated. A press dispatch from Omaha says that on such places corn is "green and luscious," while across the road, on unirrigated places, nothing is left.

The people of Brown county, Texas, are considering a proposition made by a California irrigation company to furnish a system of irrigation ditches.

The Chamber's Lake ditch, in Larimer county, Colorado, is a success. A large quantity of water being drawn from the Laramie river to the Cacha la Poudre via Chamber's Lake. The mountain cut was a very difficult piece of scientific engineering.

The Castle Rock (Colorado) creamery is now turning out something more than 2,090 pounds of butter and the same quantity of cheese each week.

Australia stands first among the wool producing countries of the world, and they are now beginning to take an active interest in irrigation.

A flow of artesian water has been the result of a bore of 260 feet, about six miles from Tammany, Idaho. It has taken two months to sink this well, some of the strata being extremely hard. The well is on the premises of Mrs. Dowd, an energetic business woman, who intends to put out 200 acres of hops next season.

The matter of irrigation is being most enthusiastically and practically investigated in Buffalo county, Nebraska.

Yakima Valley, Washington, has felt the effects of the hard times very little. The State fair is to be held at North Yakima during the last week of September.

SOME RECENT BOOKS.

Mr. Clesson S. Kinney, of Salt Lake City, Utah, has recently published, through W. H. Lowdermilk & Co., of Washington, D. C., an impressive work entitled, "A Treatise of Irrigation Law." J. G. Sutherland, of Utah, writing of the work, says:

"Mr. Clesson S. Kinney has given the profession a very useful book in his treatise on 'Irrigation.' I have looked through it with considerable study. The author has evidently prepared the work for use in that extended area of our country which he designates as the arid and semi-humid region—the area where the soil is naturally fertile, but is practically unproductive until water can be artificially supplied. He has sketched the general history of irrigation. But irrigation presupposes a supply of water. Therefore the author's work is mainly devoted to the dis-

cussion of water rights as recognized in that region where irrigation is necessary—how such rights may be acquired and preserved, or lost.

"After the beginning of placer mining in California, the courts, taking notice of the local conditions and wants, recognized the rights in running water which had gained a practical existence among miners. In the progress of evolution the right was held to extend to all applications of water to useful purposes. Riparian rights were held subordinate, that the entire water supply might be utilized, and thus every business and industry derive the benefit of it. Congress and every legislature in the States covering or including the arid region, regulated water rights on this basis. The author has lucidly explained and stated the law in its origin and in all its stages of development. He has generalized the decisions, both federal and State, with great thoroughness and accuracy. His work will be of great value to all persons who have interests depending on the use of water; and to practitioners and judges who have to deal with water rights in the Pacific States it will be invaluable."

Phillip G. Roeder, of Cleveland, Ohio, has issued a volume compiled from data gathered by him during several years' experience in Mexico as a manufacturer's agent, entitled "The Exporter's Hand Book of Mexico." It contains carefully revised lists of bankers, reliable merchants in all lines of trade, professional men, landed proprietors, mining companies, etc., in forty-three cities of Mexico. Also population of cities, railroads on which located and mail routes. In addition it contains shipping directions, customs laws and vocabulary of proper names and terms.

To those desirous of opening trade relations this book will be found invaluable. Price \$2.00, postpaid. Phillip G. Roeder, 664 Cedar Ave., Cleveland, Ohio.

RECENT LEGAL DECISIONS.

Right to Use of Water for Irrigation.—The right to the use of water for the irrigation of land, together with the ditch making such right available, becomes so attached to the land, as part and parcel thereof, as to pass by a conveyance of the land, without mentioning the water right, and to be subject to the liens and liabilities which attach to the land, and entitled to the same exemptions as the land.

Frank v. Hicks. (Supreme Court of Wyoming.) 35 Pac. Rep. 475. (74).

Rights of Stockholders in Irrigation Companies.—A stockholder of an irrigation company organized to furnish water exclusively to its stockholders is entitled to the proportion of the water carried through its irrigation canal that the amount of his stock bears to the whole amount of the stock of the company.

Rocky Ford Canal, Reservoir, Land, Loan & Trust Co. v. Simpson. (Appellate Court of Colorado.) 36 Pac. Rep. 638. (50).

What Constitutes Sufficient Complaint Against Diversion of Water.—In an action for diversion of water from a stream, a complaint which states that the complainant is the owner and in possession of land through which a certain stream of water was accustomed to flow, and that another diverted the water of the stream from its accustomed channel, need not also state that the complainant had the right to use the water, since such right is implied from his ownership of the land.

Shotwell v. Dodge. (Supreme Court of Washington.) 36 Pac. Rep. 254. (80).

Diversion of Water from Premises of Lower Riparian Owner.—A landowner who diverts the water of a stream flowing through his land into a ditch running through a porous soil, so that much of the water is lost by soaking through the bottom of the ditch, and the rest is lost at the end of the ditch, the only benefit re-

ceived being from the water that percolates sideways through the banks of the ditch, is liable, in at least nominal damages, to owners of land further down the stream, since such use of the water is not reasonable irrigation.

Shotwell v. Dodge. (Supreme Court of Washington.) 36 Pac. Rep. 254. (88).

Extent of Enforcement of Water Rights.—Where a petition alleged that petitioners were entitled to 119.43 cubic feet of water per second for two ditches; that such ditches took the water from the Platte river; that in several water districts lying above on such river, ditches of junior appropriators were diverting the water which would otherwise supply petitioners' ditches; and asked that a writ of mandamus issue, directing the state engineer, and other irrigation officers to close the gates and shut the water "from all ditches in the territory named whose priorities were later than those of" petitioners, the prayer for relief was held to be too broad and could not be granted.

Farmers' Independent Ditch Co. v. Maxwell. (Appellate Court of Colorado.) 36 Pac. Rep. 556. (113).

Grant of Rights by Ditch Company.—The board of control fixed the amount of water which a ditching company should take from a certain creek, and described the land to be irrigated by such water; and the ditch company sold a four-fifths interest in the ditch and the water, and a one-fifth interest in the same to a different party. Though the second purchaser owned more than one-fifth of the land to be irrigated by means of the ditch, he could be enjoined by the other owner from diverting more than one-fifth of the water if he failed to show what water was actually and rightfully being used on his land when he acquired title, or that the owners of the four-fifths interest in the water acquired their water rights after he had acquired title to his land.

McPhail v. Forney. (Supreme Court of Wyoming.) 35 Pac. Rep. 773. (140).

A provision in a contract between a ditch company and the owners of land irrigated by the ditch that, if the company shall willfully fail or refuse to supply any land owner with the amount of water agreed upon, the land owner shall have the right, upon payment or tender thereof, to take the water, is void, because inconsistent with the right of control incident to the ownership of the ditch, and against public policy as tending to confusion and a breach of the peace.

Farmers' Highline Canal and Reservoir Company v. White. (Col. App.) 31 Pac. Rep. 345.

A FIVE MILLION ACRE SUIT.

Judge J. O. Broadhead, of St. Louis, J. K. Rickey, of Washington, and P. B. Thompson, of New York, are preparing the papers in an important land case that is to be tried before the United States land court, whose session will begin in Denver, Oct. 15.

The case involves a tract of land 150 miles long and 50 miles wide in the Salt River valley, Arizona. There are 4,750,000 acres in the claim, a large part of which is capable of irrigation. By the expenditure of \$5,000,000 it is estimated by engineers that the land will be worth \$50,000,000. The city of Phoenix is located on the grant, and the celebrated ruins of the Casa Grande are also in its boundaries. Remains of pre-historic irrigation ditches show that the land was once under high cultivation.

The case promises to attract general attention on account of the amount involved and the romance of its history. From the records which are found in the City of Guadalajara, Mexico, it is shown that the land was granted in 1742 by Emperor Ferdinand of Spain to Don Miguel Peralta, a Spanish Knight of the Golden Fleece and Baron of Colorado. His sole descendant is the wife of J. A. Peralta Reavis, a resident of Missouri, in whose name the contest is to be made.

By the terms of the treaty of Guadalupe Hidalgo and the terms of the Gadsden Purchase all the old Mexican titles are guaranteed by the United States government, and if the contest is successful she will be paid \$1.25 per acre for all the land

occupied by settlers. The land includes the Pinal Indian reservation, a part of the White Mountain Indian reservation, and many valuable mining districts.—*St. Louis Republic*.

A COLORADO STREAM CASE.

In the case of the Water Supply and Storage Company *v.* the Larimer and Weld Irrigation Company an injunction was granted forbidding the latter to take and store away any of the waters of Dry creek, which a year ago was adjudged to be a natural stream tributary to the Poudre, at any time when such waters should be needed by prior appropriators for immediate irrigation.

LAND DAMAGES.

In the case of the Western Drain and Water Supply Company *v.* A. Z. Salomon and wife, of Denver, Colorado, tried in the County Court, the jury brought in a verdict assessing the damages at \$1,600. The case in brief is as follows:

The ditch company wanted right of way to run a ditch eighty feet wide across 320 acres of land near Platteville belonging to the Salomons; it being willing to pay \$500 for that privilege. The Salomons through their counsel, Wells, Taylor & Taylor, of Denver, and Judge Wheeler, of Platteville, wanted the full value of the land, claiming that it was worth \$10,000, saying that the ditch would render their property comparatively worthless, owing to the fact that on this land was a pond containing about forty acres, which they wished to use for the purpose of propagating fish to sell in the Denver and other markets; and the digging of this ditch would drain off the water.

WRIGHT LAW SUSTAINED.

The Supreme Court of California has affirmed the judgment of the Superior Court in the case of the Rialto Irrigation district, plaintiff and respondent, *v.* J. R. Brandon *et al.*, defendants and appellants.

The plaintiff was an irrigation district formed under the law of 1887, known as the Wright act, with its location in San Bernardino county. In constructing its works it was necessary to lay a pipe line across the lands of the defendants. The action was brought to condemn a right of way, and judgment for plaintiff, the damages being assessed. The appeal was from the judgment and order denying a new trial.

The Supreme Court holds that the appeal was without merit and the demurrer properly overruled. The argument was that the act provides only for the construction of ditches and canals, and that this does not include pipe lines; but the court holds that the language is broad enough to cover pipe lines; also that it was not error to admit the decree of the Superior Court confirming the regularity of the proceedings for the organization of the district, and that the evidence was sufficient to sustain the findings.

A CALIFORNIA CREEK IN DISPUTE.

The Riverside Water Company has instituted proceedings against all the various owners and users of water in the valley east of San Bernardino, California, claiming, it is understood, all the water flowing in Warni creek, except that used by Peter Kehl and the San Bernardino Electric Company. The defendants in this suit are four companies composed of nearly one hundred of the oldest settlers.

A decision in favor of the Pomona Land and Water Company against H. M. Loud has been rendered in the Supreme Court of California, involving about \$105,000 in payment of several large tracts of land bought by Loud during the boom.

The case of the Water Supply and Storage Company against the North Poudre Land and Canal Company at Fort Collins, Colorado, has been postponed until the September term of court.

NEW COMPANIES.

California.—*Los Angeles.*—Cahaenga Gold Mining and Irrigation Company, incorporated. Capital stock, \$100,000.

Sonora.—Salmon River Hydraulic Gold Mining and Ditch Co., reported as having filed articles of incorporation.

Pasadena.—The Pasadena Park Tract Land and Water Co., incorporated. Capital stock, \$240,000.

Colorado.—*Pueblo.*—The Bessemer Irrigating Ditch Co., incorporated. Capital stock, \$200,000.

Illinois.—*Chicago.*—The Great Western Land and Irrigation Co., incorporated by Alfred J. Tendewald, Oscar W. Brecher and William O. Olin. Capital stock, \$50,000.

Kansas.—*Independence.*—The Montgomery County Irrigating Co., incorporated by C. H. Wortz, A. C. Stich, W. M. Wade, J. W. Simpson and Henry Baden. Capital stock, \$3,000.

Montana.—*Saco.*—The Beaver Creek Irrigating Co. \$5,000.

Nebraska.—*Elm Creek.*—Elm Creek Irrigation Co. \$25,000.

Ford Precinct, Scott's Bluff County.—The Ramshorn Ditch Co., incorporated by Caroll Nichols, Yorich Nichols, John T. Logan, J. E. Ralls and Peter Vonberg. Capital stock, \$12,500.

Sutherland, Lincoln County.—The Sutherland Land and Paxton Irrigation Co., incorporated by David Hunter, Alexander Nielson and John H. Conway. Capital stock, \$60,000.

Omaha.—Paxton & Hershey Irrigating Canal and Land Co., incorporated. Capital stock, \$100,000.

Grant.—Equitable Irrigation and Water Power Co., incorporated. Capital stock, \$25,000.

Utah.—*Salt Lake City.*—The Richards Irrigation Co., incorporated by Peter Van Valkenburg, Charles B. Baker, Rufus Forbash, D. Moran Griffin, Thomas H. Smart, Sr., William A. Boggess, and others. Capital stock, \$12,000. The object of the company is to construct and maintain reservoirs, water ditches, dams, flumes, water pipes, and other appurtenances, particularly relating to the waters of Little Cottonwood creek, in that vicinity. The chief place of business will be at Union, Utah.

The Union and East Jordan Irrigation Co. has been organized with Levi Olsen, president; John W. Sharp, vice-president; John Larson, secretary and treasurer. Capital stock, \$15,000. The company's property consists of the title to the waters of Little Cottonwood creek, and the Richards and Union and East Jordan ditches.

FRUIT EXCHANGES.

California.—*Fresno.*—The State of California Raisin Growers' and Packers' Co., incorporated by W. J. Baker, R. G. Chaddock, Harroll Ghent, A. B. Butler, W. H. Hodgkins, J. H. Kelly and G. B. Noble, of Fresno, and W. M. Griffin, San Francisco, J. P. Fernald, of Oleander, and W. P. Rowell, of Easton. Capital stock, \$4,000.

Corralitos.—Corralitos Co-operative Drying and Canning Co., incorporated by F. M. Hitchings, G. A. Webb, John Rossi, C. E. Bowman, H. M. Ryder, A. W. Tate and L. M. Dye. Capital stock, \$50,000.

Santa Cruz.—Santa Cruz County Fruit Growers' Union, incorporated. Capital stock, \$40,000.

Watsonville.—Pajaro Valley Fruit Exchange, incorporated. Capital stock, \$50,000.

Orosi, Tulare County.—The Orosi Fruit Exchange, incorporated by S. H. Ross, V. E. Sloane, O. C. Goodin, William Wood, A. J. Bump. Capital stock, \$10,000.

Oregon.—*La Grande.*—The Grand Ronde Valley Orchard Co. filed supplemental articles of incorporation increasing the capital stock to \$50,000. W. G. Hunter is president of the company, and A. C. Miller, secretary.

Washington.—*Seattle.*—Northwest Fruit and Produce Auction Co., incorporated.

PUBLISHER'S DEPARTMENT.

THE COST OF STARTING A HOME IN KERN DELTA.

DURING the past few months much space has been devoted in this department to the presentation of various phases of life in the famous Kern Delta colonies. These articles have dealt with the system of irrigation, colossal in size and yet wonderfully simple in design; with the orchard industry, in relation to several kinds of deciduous fruits; with the experimental farms, conducted by expert ability for the benefit of new settlers; and with many other aspects of the budding industrial life of this wonderful valley of California.

WHAT IT COSTS THE SETTLER TO START.

The approach of winter will remind thousands of California, where winter is but an Indian summer. These thousands will wonder what it costs to start a home in Kern Valley, and what sort of a living can be earned from its soil. Mr. S. W. Fergusson, manager of the Kern County Land Company, has studied this question carefully, and is willing to have the results of his study made public. He has had the advantage, of course, of every possible facility in arriving at conclusions, and his statement carries with it the weight of a rich personal experience in the industry with which his statement deals. There is no satisfactory way to state his conclusions except by giving the facts and figures just as he has worked them out in tabular form, as it is a serious enterprise for any man to move his home to a new country and his expectations ought to be brought down to a matter of cold calculation, capable of being put to any reasonable test.

HERE ARE THE ACTUAL FIGURES.

The average cost of land in Kern county is \$80 per acre, although very good land can be had for 25 per cent. less than that. Mr. Fergusson's estimate has been based on \$80 land. In this case he takes a 40-acre farm for example, though very good results can be realized by the average family on twenty acres.

One-fourth of the purchase money, balance in three, four and five years at 7 per cent. interest.....	\$300.00
Frame house of 4 rooms, constructed of lumber, 24x24, with verandas.....	350.00
Furniture according to requirements of farmer.....	100.00
Barn and outbuildings.....	150.00
Well, bored 50 to 100 ft., with pump complete.....	75.00
Fencing—forty acres—320 rods at \$1.00 (post and three wires), with netting.....	\$320.00
Deduct half cost of three sides, 240 rods at 50c. (borne by neighbors).....	120.00
Cross fencing alfalfa, hog proof.....	100.00
Implements and live stock:	
2 horses at \$75.....	150.00
Wagon \$100, harness \$30, plough \$12, cultivator \$7.....	149.00
Mowing machine \$60, horse rake \$22.....	82.00
Sundry hand tools and implements.....	15.00
4 cows at \$40, 6 sows at \$10.....	220.00
6 dozen hens at \$4.....	24.00
Seed for 18 acres of alfalfa at \$3.....	54.00
Seed for 18 acres of grain (sown with alfalfa).....	9.00
Carried forward.....	\$2,473.00

Brought forward.....	\$2,473.00
Seed for 12 acres—mixed farming—grain at 50c. per acre (to be followed by corn, potatoes, beans, pumpkins, etc.).....	6.00
Nursery stock for young orchard, 8 acres at \$10.....	80.00
Seed for two acres of mixed vegetables, etc.....	10.00
Hired labor, six months at \$20 (exclusive of board)...	120.00
Provision for:	
6 months' groceries, \$20.....	120.00
Feed of horses, cows, etc., at commencement.....	100.00
Water rate one year at \$1.50 per acre.....	60.00
Tax estimate.....	30.00
Fuel, 6 cords at \$3 per cord.....	18.00
	\$3,022.00

N. B.—The foregoing figures are dependent upon the settler accomplishing the ordinary cultivation and work through his own efforts, assisted only by one hired man.

THE FIRST YEAR'S RETURNS.

The returns of reasonable industry and management on the basis of the foregoing Mr. Fergusson estimates as follows for the first year:

Live Stock:	
Sale of four calves at \$6.....	\$ 24.00
60 young pigs at \$4.....	240.00
700 chickens at 25c.....	175.00
300 doz. eggs at 20c.....	60.00
Dairy produce from four cows for eight months in the year.....	128.00
Sale or valuation of ten acres of alfalfa hay (1st season), 30 tons at \$5.....	150.00
12 acres of grain hay, 1½ to 2½ tons per acre, estimated at 18 tons, at \$7.....	123.00
Followed by, say—	
6 acres of corn, 13,000 lbs. shelled out at 7½c.....	178.25
6 acres of potatoes, 50 sacks per acre, or 30,000 lbs., at 65c. per hundred.....	195.00
Pumpkins grown in 8 acres at trees' worth.....	80.00
2 acres of market vegetables at 50c.....	100.00
	\$1,454.25

The average yield of alfalfa after the first season is six to ten tons; price at the time of writing \$7 at the farm. Land suitable for market gardening rents for \$10 per acre per annum.

PROPERTY VALUES AT THE END OF FIRST YEAR.

At the finish of the first year, the careful farmer should find himself with the sum of \$1,500 in hand, to which—in order to ascertain the precise result of his work—should be added the valuation of live farm stock, improvements, and part purchase money, amounting at cost to:

Payment, one-fourth price of land.....	\$800.00
House \$350, furniture \$100, barn and outbuildings \$150, well \$75 to \$150, fencing \$300.....	975.00 to 1,550
Implements and live stock.....	638.00
Valuation, 8 acres orchard one year.....	200.00
Add cash on hand.....	2,613.00
Total assets.....	4,113.00
Deduct original outlay.....	3,022.00
Balance net profit in cash.....	\$1,091.00

Or 35 per cent. of the sum originally invested, after providing for maintenance of self and family.

The increase in value of breeding stock will more than compensate for decrease in value of buildings and implements by reason of wear and tear.

At the commencement of the second and third years, the annual interest on the outstanding balance would fall due. Such an amount, however, could be amply provided for from increased returns accruing from sales of live stock. At this juncture it might be to the interest of the settler to reduce the principal outstanding on the purchase.

At the expiration of these three seasons, if not settled for before, the colonist, if he be wise and frugal, should have acquired some \$3,000 wherewith to meet his second instalment of \$800 due the first of the ensuing year. The fourth year his orchard would, with intelligent management, add \$400 (that is, eight acres at \$50) net profit; the fifth year \$75 per acre, or \$600; the sixth year the ranch could be cleared of all indebtedness and so revert solely to the purchaser; the orchard would then and thereafter annually upon an average augment the net income to the extent of \$800, rendering aggregate yearly net return of from \$1,800 to \$3,000 for an original investment of \$3,000.

The increase in land values, resulting from surrounding improvements, must also be taken into account, together with the market and transportation facilities.

KERN COUNTY THE PLACE.

Readers of THE AGE who are looking for homes on irrigated lands, where good and steady profits will reward modest investment and reasonable industry, should get all the facts about the Kern Delta. Address Kern County Land Co., S. W. Fergusson, manager, Bakersfield, Cal.

Follow future articles in this department. They will be:

OCTOBER: *Character in Communities*, describing the company's plan of application blank for home-seekers to fill out. (Illustrated.)

NOVEMBER: *Civilizing a Section of Land*, describing the remarkable modern improvements the company will supply to a colony purchasing a section. (Illustrated.)

DECEMBER: *Electrical Future of Kern Delta*, showing the results to follow the installation of a great plant, and the manner in which electricity will be applied to industrial and household purposes.

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DEHORNING CLIPPERS.

Much has been said and written about dehorning during the last few years. You can scarcely pick up an agricultural paper which does not contain some allusion to it. It is universally conceded that dehorning is the proper thing in cattle raising. To remove the obnoxious horns of a cow or steer with the old-fashioned method of sawing them off is a heart-rending undertaking. The **Newton & McGee's Dehorning Clipper** does the work almost instantly, cuts perfectly smooth, heals quickly, and causes the animal but little pain. Their latest improved dehorner has one-third more power than anything before produced. They very easily cut off a wagon spoke, an ax-handle, etc. It is evident that clippers with such power could very easily remove the horns. The H. H. BROWN MANUFACTURING COMPANY, of Decatur, Illinois, whose advertisement is appearing in the columns of this paper, are the sole manufacturers. From a circular they are sending out we copy the following: "We guarantee the knives to do the work. If any part should break from a flaw or defect we will replace it without expense to the purchaser. When operating with the dehorner the head must be securely fastened so that the animal cannot throw it from one side to the other, as in that way one is liable to break or chip the blade. These blades are the same as any edged tool and must be handled accordingly. We do not guarantee them where the party operating tries to hold the animal with the dehorner. After dehorning, if it is warm weather, apply a little pine tar. If they are inclined to bleed too much, apply a little soot or flour. In feeding and watering it does not require one-half the troughs; it does not require as much shed room; there is no hooking of stock. Dehorned cattle crowd up to feed and water like sheep, and all fare alike. How many farmers have lost their lives on account of not having a cross bull dehorned. It is said by cattle feeders, 'If you want to see a well-fatted bunch of cattle you will find them with their horns off.' How to accomplish dehorning with as little pain to the animal as possible is the object." Address them for descriptive information concerning dehorning.

BIG RED APPLES

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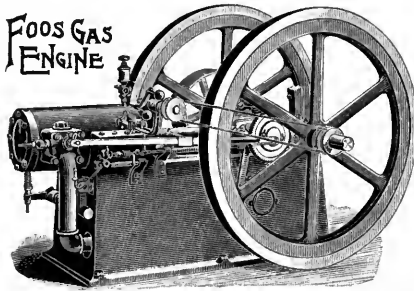
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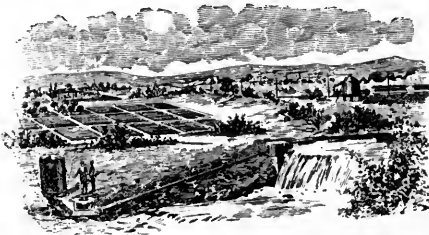
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VOL. VII.

CHICAGO, OCTOBER, 1894.

No. 4.

THE PROGRESS OF WESTERN AMERICA.

THE Third National Irrigation Congress at Denver was the most important event affecting the progress of western America during the month of September, and no apology is offered for devoting this department exclusively to an editorial review of the national movement, of which the congress is the expression. The recent convention did not equal that of three years ago at Salt Lake, nor that of one year ago at Los Angeles, in point of attendance. It far surpassed both in its representative character. The entire arid region was represented by actual residents, and nearly every delegation contained a few men especially fitted, by study and experience, to deal with the work of the congress. The Salt Lake convention dealt only with one aspect of the subject—the advisability of ceding the lands. The Los Angeles convention declared general principles and created the State Commissions in the hope that the result of a year's study and investigation would produce a comprehensive policy on lines of compromise. The Denver convention made progress toward the desired end, and as far as it went that progress was distinctly in the right direction. It did not proceed as far toward the goal as some of the leaders desired, but on the whole its results were more substantial than those achieved by its predecessors. In the meantime, the national organization remains in fighting trim, with its face toward the sunrise.

Two Intellectual Factions. The purely public questions to be dealt with in shaping the destinies of Arid America are larger and more complex than those involved in the discussion of tariff and silver. To work out a code of laws, national and State, and to devise systems of administration under which those laws may be administered with due regard to public and private interests, demands the highest qualities of statesmanship. As has been said by Judge Emery, of Kansas, these are new problems for the Anglo-Saxon mind. But it is because they are so serious in character, and so far-

reaching in ultimate effects, that the leaders of the movement have done, and propose to do, all in their power to have them studied to final conclusions. The Denver congress developed the fact that there are two intellectual factions in this movement. The line of cleavage is not convictions, but temperament. One of these factions presses forward to results. It wants to face the difficulties of the situation. It is ready to stand out in the sunlight and discuss fearlessly the question of national or State control of irrigable lands, the question of leasing the pastoral lands, the question of an enlightened forestry policy, the immensely intricate and baffling question of the division of interstate streams. This faction was represented in the congress by the National Committee and the State Commissions. There is another faction which shrinks from any attempt to arrive at definite conclusions. It is appalled at the proposition of settling anything, and prefers to declare only glittering generalities. It is not yet quite certain what it thinks about these vital matters, except that it is willing to give three cheers for the old flag and an appropriation. It closes its eyes to the fact that under present laws the most valuable lands are being steadily absorbed by syndicates and corporations, that the forests are being destroyed, that streams are being recklessly appropriated, that questions between States are becoming graver and more complicated, and that the free public range is the theater of frontier warfare between cattlemen, sheepmen and settlers. This faction is inclined to leave nearly everything to the future. In the recent congress the friends of progress did not accomplish all they hoped to do, nor did the friends of the policy of inaction prevent the accomplishment of all they were afraid to venture upon.

Some Lessons Learned. It was announced one year ago that the reports of the several State Commissions would be the basis for the action of the Denver congress. Most of these commissions were extremely faithful to the duties intrusted to them,

although they received no pay for services and even defrayed the expense of their work largely from their own personal contributions. The congress listened to only a portion of the reports of these commissions. The Committee on Resolutions was able to consider the voluminous and valuable suggestions only in a hasty and casual way. This was due in part to lack of time, but it was also due to the unwillingness of a considerable element to consider anything looking to definite results. And yet the congress has ordered that the commission system shall be continued for another year, with new appointments. The National Committee, learning something from experience, will very probably adopt means to get the work of its commissions before the delegates in a different way next year. It has been suggested that the call for the next congress shall be issued six months in advance of its meeting, and that an effort shall be made to have the appointment of delegates made three or four months in advance. The commissions will be asked to have their reports ready as soon as delegates are appointed, and the National Committee will then attempt to have them printed in one pamphlet and put into the hands of all delegates, so that the reports may have the most mature consideration weeks before the convention assembles. By this means everybody will know what is to be considered, and there will be ample time to organize the forces on both sides. It is hoped that no excursions will interfere with the serious business of the congress next time. Ornamental features of the program should be relegated to morning and evening hours. Four or five working days will be available for working delegates. When to this program we add the opportunities for discussion which will be given by newspapers and magazines, by minor conventions and by coming sessions of various legislatures, it will be quickly seen that greater results should be obtained at the Fourth Congress, to be held at Albuquerque, N. M., in the autumn of 1895, than were realized on any previous occasion.

Arizona and California Ideas. Any worthy consideration of the work of the Fourth Congress must begin with a review of the reports of the State Commissions. Chairman Van Derwerker, of Arizona, submitted a brief report devoted exclusively to an argument in favor of the cession of the lands. His principle contention was, that water and lands should be under one control, and that as Congress has no power to deprive the State of its control of non-navigable streams the lands also should be turned over to the State. The California commission failed to submit a complete official report, but in the absence of this, Commissioner L. M. Holt furnished a very able letter, devoted to a careful discussion of the

district law of his State. Mr. Holt was closely associated with Mr. Wright and others in the championship of this law, but the weaknesses which it has developed were never more clearly set forth than in this letter, which the convention heard with profound interest. He insists that there must be rigid State supervision, and suggests a State board of irrigation, composed of five members, four of whom should be *ex-officio* members by virtue of holding certain State official positions, while the fifth should be the State engineer. He says the attorney-general should also be a member. This board should have jurisdiction over the formation of districts and none should be allowed to incorporate until all engineering and legal questions had been discussed and the board had given its sanction. In this connection it is interesting to remark that Hon. C. C. Wright will appear before the Supreme Court of the United States at Washington, October 8th, to argue upon the question of the validity of the law, and that the request that the case be advanced upon the calendar made by formal resolution of the Los Angeles congress, bore fruit in just one year to a day. Mr. Holt's other important suggestion is, that States, upon authorizing the formation of a district, should issue its own bonds for the amount required, putting the bonds of the district in the State treasury, and, by reason of the difference in interest and selling value of the two classes of bonds, realize a sufficient profit to pay the entire cost of maintaining the State board of irrigation. Mr. Holt says that with such changes as he suggests in the district system it would be applicable to unoccupied public lands, provided the control of the district shall remain with the State board until a sufficient number of settlers occupy the land. Mr. Holt stated that the California districts are already burdened with a debt of \$16,000,000, and that if bonds could be readily sold the amount would quickly rise to \$20,000,000. Upon hearing this, some of the Mormon delegates from Utah arose in their places to thank God that their canal systems were the product of their own labor and genius, and that there is not now and never has been a dollar of indebtedness outstanding against them.

Colorado's Pointed Suggestions. The report of the Colorado Commission claims 4,000,000 acres under ditch and 1,600,000 acres under cultivation, and states that the problem is to get water for a vast area of irrigable land. The report furnishes a large amount of valuable data concerning water supply and land. It also describes the gradual development and present status of Colorado local law. The conclusions of the commission are as follows:

1. That none of the public lands should be acquired except under the homestead law.

2. That we believe it would be to the interest of the arid west for the government to withhold all public lands until water is procured for the same.

3. That land should not be monopolized for speculative purposes, and all unearned land now held by railroads or other incorporations should be reclaimed by the government and held for actual settlers only.

4. That Congress should make appropriations to determine the extent and availability of underground, artesian and storm waters for irrigation purposes.

5. That the forests protecting the heads of the mountain streams should be most carefully preserved, and that the forest reservations in the hands of the government should be protected and watched by a detail of government troops.

6. That in the opinion of the commission the Carey provision for the cession of 1,000,000 acres of land is of little application to Colorado, but we recommend a careful and conscientious trial of it.

Idaho Favored Cession.

The report of the Idaho commission is signed by Prof. J. E. Ostrander, a gentleman who was one of the most useful and faithful members of the congress. The report states that 2,000,000 acres of land are now under ditch in Idaho and only 250,000 under cultivation. At least 1,000,000 acres more can be reclaimed at a nominal cost per acre, and a considerably larger area at a cost not at present justifiable, though not ultimately prohibitive. It is stated that the commission has been unable to agree upon several subjects, but it is unanimously of the opinion that the Wright law of California is not applicable to present conditions in Idaho. Prof. Ostrander submits also his personal views and favors the unconditional cession to the States of all arid lands within their limits. He would then have the State employ an engineer to make plans for the reclamation of these lands and supervise their construction, the work being let to the lowest responsible bidder. The State should issue bonds to pay for the works and the State engineer should fix the price of the land, making it sufficient to cover cost of reclamation, interest and other charges. The land should be sold only to actual settlers. Ultimately he would have the control pass to the settlers under some form of district law.

Kansas for National Control.

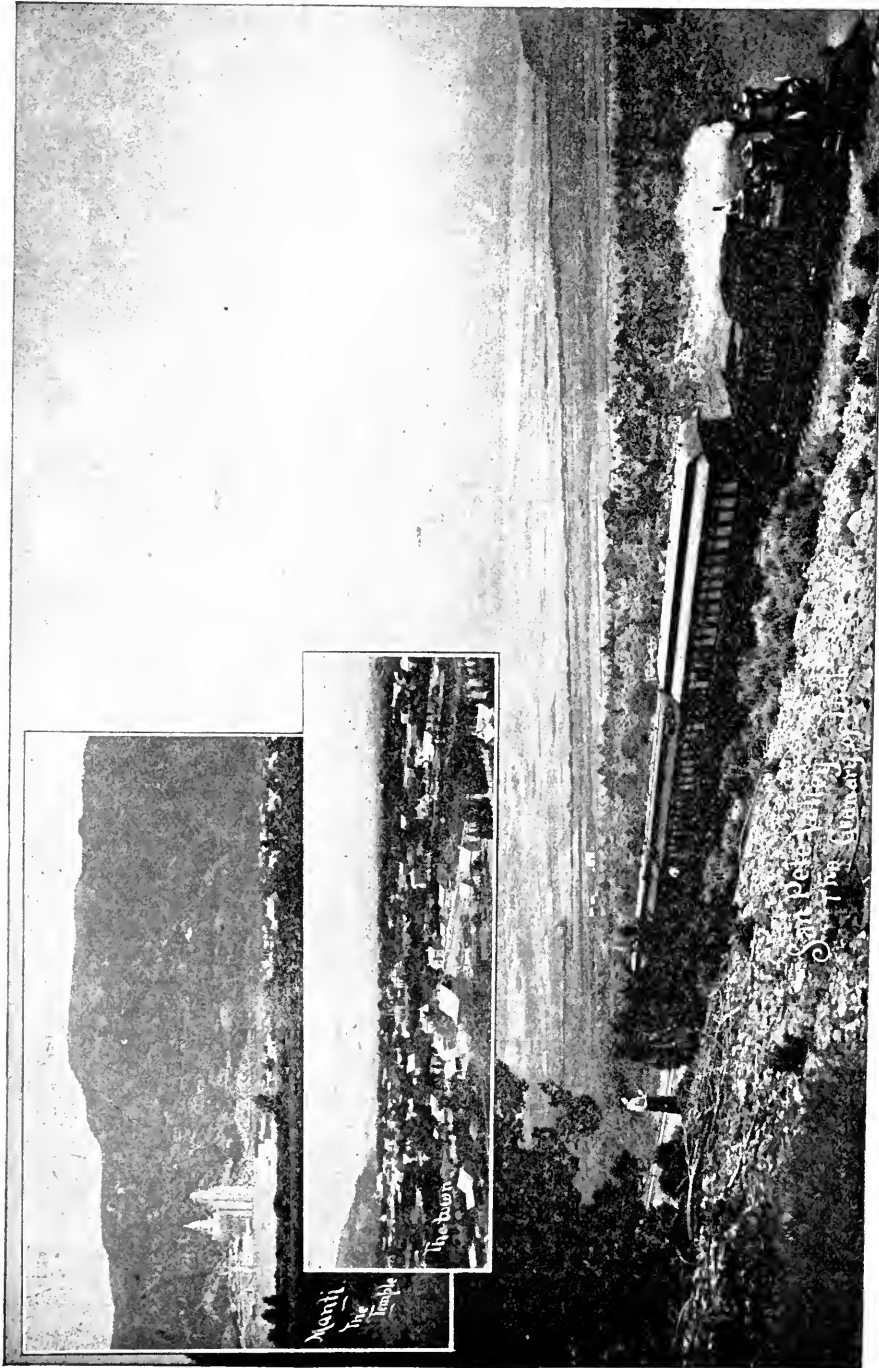
The report of the Kansas commission is largely the work of Judge Gregory, although he had the assistance of a notable commission. It is divided into two parts, dealing with national and state matters. A considerable portion of the general report deals with the necessity of finding homes for great numbers of people, and points out the advantages certain to accrue to our institutions. This part of the report is a real contribution to literature and we regret that it cannot be reproduced in full at this time. Coming to specific sug-

gestions, the report favors the division of interstate waters under the control of the general government and the reservation of mountain catchment areas, reservation sites and forests as means to this end. It also states that the recovery of subterranean waters should be stimulated by government experiment and investigation. The report favors the restriction of the homestead right to forty acres, and the creation of a federal commission or court to deal with interstate waters, forests, pastoral lands and of works which may be undertaken by the federal government. The State report describes existing conditions in western Kansas, and states the further needs to be supplied by legislation as follows: "A further elaboration of State irrigation laws to render effective and operative the district system, which has already been inaugurated; the provision of a State irrigation department, headed by a competent engineer; a complete and authoritative examination into the character, extent and availability of our subterranean water supply, and the thorough dissemination of information as to all phases of irrigation work among our people."

The Montana Report.

Chairman S. B. Robbins, of the Montana Commission, labored under great difficulties in perfecting his report. The original member for Montana resigned after appointing his commission and Mr. Robbins was not able to take up the work until the middle of July, and even then failed to receive any support from his fellow commissioners. For the credit of his State, however, he devoted himself assiduously to the work, obtaining the coöperation of the newspapers and entering into wide correspondence. The result is a careful and exhaustive report, describing the conditions existing in Montana. We wish the entire report could be read by everybody in that State. It would certainly awaken them to the importance of their irrigation interests and lead them to send a large delegation to the next congress. Mr. Robbins favors a uniform unit of measurement throughout all the States, points out the deficiency of local laws in the matter of the supervision and inspection of streams and irrigation works, and highly commends the Wyoming system of laws. He also favors the speedy establishment of an engineering department as a feature of State administration. The report states that there is great diversity of opinion in Montana as to the manner in which the arid public lands should be reclaimed. One State convention is declared in favor of cession and another against it. The California district system is not favored. The following specific recommendations are made:

1. There should be one or more national consulting engineers or commissioners appointed to act in connection with State Boards of Control to determine



SCENES IN UTAH, ON THE LINE OF THE RIO GRANDE WESTERN.

interstate or international priorities and diversion of waters, with agreements as to the manner in which the waters of the different States should be apportioned.

2. There should be better provisions for the protection of the forests and all timber lands, and some pecuniary advantage to be derived by settlers to encourage them to plant and carefully attend to the growth of trees as windbreaks and to prevent evaporation.

3. There should be governmental aid in the construction of reservoirs upon the head waters of streams navigable in any part of their course.

4. There should be a government commission vested with authority to examine and report upon all irrigation projects offered upon the market, such investigations to be made upon the request of intending investors.

Nevada's Great Possibilities. One of the most complete and painstaking reports is that of the Nevada Commission, of which Gen. John E. Jones, now the nominee of the Silver party for governor, was chairman. It was presented to the Congress by L. H. Taylor, C. E., who succeeds Gen. Jones as the Nevada member of the National Committee. To both of these gentlemen and their colleagues high praise is due for the manner in which they performed the work committed to them. They sent circulars of inquiry throughout the State, and made a careful study of physical conditions and of popular opinion. They report that there are approximately the following classifications of surface areas in Nevada: Water area, 1,081,600 acres; forestry, 2,000,000; grazing, 30,000,000; agricultural lands, 20,000,000 (6,000,000 irrigable, 14,000,000 non-irrigable); mineral lands, 15,000,000; saline, borax, nitre and sulphur deposits, alkali flats, 3,656,000. The report further describes the topography, mountain formation, lakes and rivers. Rainfall and snowfall are discussed at length. The report asserts that not less than 5,886,000 acres of Nevada soil can be irrigated, a large portion of it being government land. The report clearly sets forth the imperative need of enlightened national and State legislation to enable Nevada to take full advantage of her home-making possibilities. It fixes the maximum amount of arable land to be taken by a settler at 160 acres, and favors the conditional transfer of the lands to the States as the only feasible and constitutional way to reclaim them. It says: "It is neither the function nor the duty of the government of the United States to improve the public lands or construct reservoirs or canals for irrigation. Moreover, this could not be done by the federal government without the consent of the States, and we are not willing to surrender the control of our waterways and the use

of the water for irrigation purposes to the Congress of the United States, or any power not directly amenable to the people of the States." But the report insists that title should not pass until a home is established and the lands reduced to possession. It says the grazing lands should be reserved for a common pasture, subject to the regulation of State laws. The report also favors State ownership of waterways, and rigid State regulation over the use of water for irrigation and other purposes.

**An Able
Nebraska
Report.**

One of the most creditable reports in the entire list was submitted by Chairman Charles P. Ross, of the Nebraska Commission. It covered a very wide range of topics quite exhaustively and was presented to delegates in the form of a well-printed pamphlet of thirty-three pages. A portion of the report is devoted to a description of irrigation conditions in Nebraska, and it may be said without invidious comparison that it furnishes altogether the best account of this subject in existence. Surface and underground waters are fully discussed, and it is clearly demonstrated that the State has an important and promising future in this respect. There is much more in the Nebraska report than can be summarized in this place. It ought to be in every irrigation library. It reflects credit alike upon Chairman Ross and the State of Nebraska. The recommendations for national legislation include the abrogation of the commutation clause, its restriction to heads of families, the reduction of the amount of land to be taken to eighty acres where one crop per annum is raised, and to forty acres where more than one crop is raised, and urges that ten years' residence be required before final proof can be made. It favors the leasing of the pasture lands, to be apportioned to different irrigation districts. It closes with the wise remark, "We recognize that principles are not details."

**North
Dakota.**

The report of the North Dakota Commission is signed by Chairman M. F. Merchant, W. W. Barrett and W. J. Woods. It declares that irrigation and forestry are intimately related and rank among the foremost economic problems of the time. It describes prevailing conditions in North Dakota and the benefits to accrue to the State from systematic irrigation. It declares that national assistance is required for the proper development of the interests at stake. It also insists on rigid national control of lands and waters. The evil effects of the hot winds are considered, and the suggestion made that active steps be taken to induce the governments of the United States, Canada and Mexico to develop and maintain vast and compact bodies of forests and chains of lakes with a view of mitigating the trouble. A cabinet department devoted to irrigation and for-

estry is also advocated. The portion of the report which deals with the physical conditions of North Dakota, its water supplies, irrigable lands, and the methods by which the two are to be brought together, is both valuable and interesting, and we hope to see it published fully hereafter. The chairman of the North Dakota Commission traveled extensively in order to obtain information for this report, and the thanks of the Irrigation Congress are due him for care he has bestowed on the work.

New Mexico is Conservative. The report of the New Mexico Commission, largely the work of Mr. Mortimer A. Downing, is of a very conservative character. It describes the history of irrigation development in that ancient territory. The repeal of the Desert Land Law is demanded, a law favored "giving individuals or corporations a right to reclaim land and to own it in fee simple on proof of reclamation." It also favors a law giving States and territories the right to select tracts for reclamation, but insists upon the necessity of federal supervision of works, whether public or private. The report closes with a most cordial invitation for the next Congress to assemble at Albuquerque, an invitation which was accepted by a handsome majority vote.

Texas Presents Two Views. The report of the Texas Commission, signed by Chairman J. J. Walker, is brief but pointed. It favors the division and distribution of interstate streams by the federal government under a national commission, and the retention under federal control of all main water sources and catchment basins. It favors the cession of the lands and the speedy adoption of a policy of forest preservation. It favors the limitation of the amount of land to be taken by a single individual to eighty acres. The Texas delegation at Denver, appointed by the governor, endorsed the report, except the recommendation for cession. On this point it said: "We believe that all national lands should be reclaimed, if possible, but kept under the control of the national government for homestead purposes for settlers, to the end that the same may pass into the hands of the small farmer instead of into that of corporations or large holders."

Suggestions from Oregon. The Oregon Commission presents a report which furnishes evidence of careful thought and faithful work on the part of Chairman Brigham and associates. It begins with a full description of the irrigable lands and water supply of arid Oregon, one of the most promising districts in Western America. It also describes the soil, climate and range of productions. This part of the report is worthy of wide reading and study, and it is hoped that it will be made available for this purpose in early future. The recommendations for legislation

are clearly defined. An appropriation of not less than \$5,000,000, to be apportioned to the several States and Territories according to their area of available unreclaimed lands, to be expended in the prosecution of surveys, is earnestly advocated. This money, says the report, should be expended by a board of five State Commissioners, who should be charged with the careful investigation of all questions pertaining to waters and lands. When the results of this investigation are available, 4,000,000 acres should be ceded to each State for purposes of reclamation. Stringent forestry laws are also favored. An enlightened system of State administration, based upon the Wyoming laws in the main, is also urged. Perhaps it may be said that the Oregon report surpasses all others in the quality of clear thinking and careful definition of conclusions.

Much Credit Due Utah. The report of the Utah Commission was prepared under peculiar circumstances. By a series of misunderstandings the commission was not organized until late in August, but its work was entirely successful and its report was presented to the congress in the form of a handsomely printed pamphlet of twenty-four pages. It was prepared by Col. Chas. L. Stevenson, of Salt Lake City, acting under the authority of a commission consisting of William H. Rowe, chairman; Samuel Fortier, L. W. Shurtliff, L. Holbrook, C. E. Wantland and C. W. Aldrich. Very great credit is due Mr. Wantland for arousing public interest in the work of the commission and making it possible to secure so creditable a report in so short a time. The commission reviews the interesting history of irrigation in Utah, and then presents, in the form of compact statistical tables, a number of topics relating to water and land in that Territory. It also reviews the policy of the government relating to land donations and appropriations for internal improvements. The tenor of the report is favorable to State control. Utah will receive a magnificent donation of lands with the realization of statehood, and, both in her constitutional convention and the next session of the legislature, her people must consider irrigation policies as the first and foremost of all public questions.

Washington Favors Small Farms. The report of Dr. N. G. Blalock, chairman of the Washington Commission, shows that irrigation in his State is a new but extremely promising industry. It is going forward with strides and bounds, and it is already claimed that the small farm is the coming institution in that State. The report shows that 100,000 acres are already under ditch and 40,000 acres under cultivation. All the physical conditions are favorable to extensive development. The commission believes that the making of millions of new homes is the most urgent work before the people of this country to-day,

and that this should be accomplished either by liberal national appropriations, or by ceding the lands to the States.

Wyoming Has Vigorous Ideas. The Wyoming report, prepared by Elwood Mead, is one of unusual value and interest. It says the great need of Wyoming is agricultural development, and the first step toward this end is to secure such changes in land laws as will adapt them to the conditions and needs of the arid region. "Present laws fail in the following particulars: Control of land and water is divided. Public land and public water should be under one authority. Instead of this, the State is charged with the supervision of the water supply. The federal government manages the land." Mr. Mead's idea is, that the opportunity offered by the Carey law should be fully utilized, and that there is no pressing demand for further legislation in this direction until this has been done. He also points out the patent fact that settlement in the arid region can only be successfully accomplished in groups or colonies. He believes that colonies can be organized to reclaim lands successfully under the Carey law. "It will be possible to create communities consisting of hundreds of homes with the same facility that the single homestead is established under the present land laws, and the occupancy and reclamation of the land, occupied by these communities, will be far more successfully accomplished than is the establishment of the isolated home under the operation of either the Homestead law or the Desert Land law." The report points out the injury inflicted upon the State by the destruction of the native grasses and says, "To remedy these evils it is suggested that changes be made in the land laws by which the irrigable and grazing lands will be united and a homestead made to embrace a portion of both." The report opposes the limitation of the farm unit to forty acres as inapplicable to Wyoming, and also opposes the division of interstate streams under federal authority. It favors the creation of a national commission to consider this question with a view to its settlement on some fair basis.

The Committee on Resolutions. No irrigation congress ever before assembled had such material for its deliberations as that furnished by these reports. But it was impossible, in the time available, to digest it. Even the Committee on Resolutions was unable to more than glance hastily through these admirable reports. The excursion to Rocky Ford practically robbed the committee as a whole of the only day available for its deliberations. This was in marked contrast to the opportunities of last year's committee. On that occasion the Committee on Resolutions devoted three or four days and nights to its work. At Denver the whole burden rested upon

a small sub-committee. The committee as a whole did not even have time to carefully review and revise the work of the sub-committee. This was unfortunate for the committee and for the congress. It rendered it impossible to accomplish the much-desired end—the union of western sentiment upon a comprehensive national policy. But in spite of difficulties progress was made in the right direction and patience will yet do its perfect work. The early appointment of delegates next year, so that the reports may be placed before them several weeks in advance of the meeting, will contribute much to the unification of thought. Only a short session of Congress will intervene before the convention at Albuquerque and the instructions given to the National Executive Committee map out ample work for that session.

To Repeal the Desert Act. The making of a great irrigation policy begins wisely and properly with a demand for the repeal of the Desert Land law. It was inevitable that this proposition should encounter strenuous opposition. Powerful interests have profited, and are profiting to-day, from the existence of this anomalous and illogical statute. These interests found many spokesmen in the debate, but on the roll call of States the convention voted overwhelmingly for repeal. This action should not be misunderstood. The Third National Irrigation Congress was not hostile to capital, and still less so to vested rights. It was emphatically in favor of protecting and fostering investment. It had no harsh words for those who have acquired valuable land under the Desert act, but it was opposed unalterably to the continuance of the policy of deception and absorption which flourishes to-day under that bad law. The congress insisted that the remaining public lands should be handled in a better and wiser way. The National Committee will try to organize a vigorous and effective campaign for the repeal of the Desert act.

A National Irrigation Commission. The most important expression in the Denver platform, as a matter for immediate consideration, is the demand for the appointment of a National Irrigation Commission. If this can be obtained it will prove an acorn from which a mighty oak may grow. The demand is for a commission having full power to consider, in the name of the nation, the vast and far-reaching problems involved in the development of a national policy of land reclamation and water and forest conservation. Ultimately the commission should be empowered to carry out large plans of administration. It should be an independent authority, and not a mere bureau attached to existing departments. It should be able to utilize the information and facilities of the Interior, Agricultural and War Departments, and should be analogous to the Interstate

Commerce Commission. This commission cannot be created too soon. It is high time that the national authority over western problems was exerted, not as opposing, but as a coöperative force, in connection with the work of the States. Whatever may be the future of the great public forests, and the irrigable and pastoral lands, they are to-day the property, and therefore the just concern, of the nation. They are to be developed for the benefit of the American people as a whole. There is no other enlightened nation which would hesitate to deal with questions which concern its future so largely and intimately. The remaining session of the Fifty-third Congress will be but four months long. In that brief time nothing which looks to definite and final results in the way of an irrigation policy can pass. But if between now and the middle of January public sentiment can be organized, it ought to be possible to get legislation creating the National Irrigation Commission, with a modest appropriation. The whole force of the irrigation movement ought to be directed to this end from now until the present Congress expires. No reasonable objection can be urged to the commission, and no reasonable excuse offered for delay. It will take much time to obtain results after the commission is in operation. In the meantime, the way will be prepared for action while the people are still debating the character of future policies.

**Mexico
and
Canada.**

A very pleasant and significant feature of the Congress was the presence of Senor Ybarolla, of Mexico, and Messrs. Pearce and Dennis, of Canada. Irrigation is a live and growing issue beyond our southern and northern boundaries. The organized irrigation movement is now continental in the true sense. The three great countries of North America march shoulder to shoulder toward a common destiny. All of them will utilize irrigation in large and effective ways. The expression in the platform in favor of a temporary commission to consider and adjudicate questions arising over international waters merits the speedy and favorable action of Congress. If these waters are permitted to remain without consideration until they shall involve States and countries in loss and discord, when it is now so easy and simple a matter to deal with them, what shall be said of our American statesmanship?

**Compromise
Postponed
One Year.**

The Denver Congress did not result in a definite compromise between the friends and opponents of cession, as many had hoped. But it did result in progress toward that much-desired end. The majority of the Committee on Resolutions reported in favor of a law which would permit States to select tracts for reclamation, make them the basis of security and colonize them. The lands were to remain under federal

ownership until, when reclaimed and settled, they passed through the State to the individual settler. There is no question but what this proposition could have been carried by the brute force of the roll call, but it would have resulted in discord. And harmony was the very essence of the result desired by the friends of compromise. Those who are afraid to trust the States with any authority thought the proposition savored too much of cession, while some of the strongest friends of State control preferred that the Carey law should be thoroughly tried before anything more is asked or suggested. Under these circumstances the Committee on Resolutions withdrew sections four and five of the majority report and substituted a resolution referring back to the State Commissions, to report to the next Irrigation Congress, the question of national policy, with instructions to devise a plan looking to the reclamation of the arid lands by the coöperation of national and State authorities. Something has been gained, because the subject has been put conspicuously before the country and started on the road to settlement. Nothing has been lost, since it is generally admitted that no legislation of a definite character could be obtained from Congress in the coming short session.

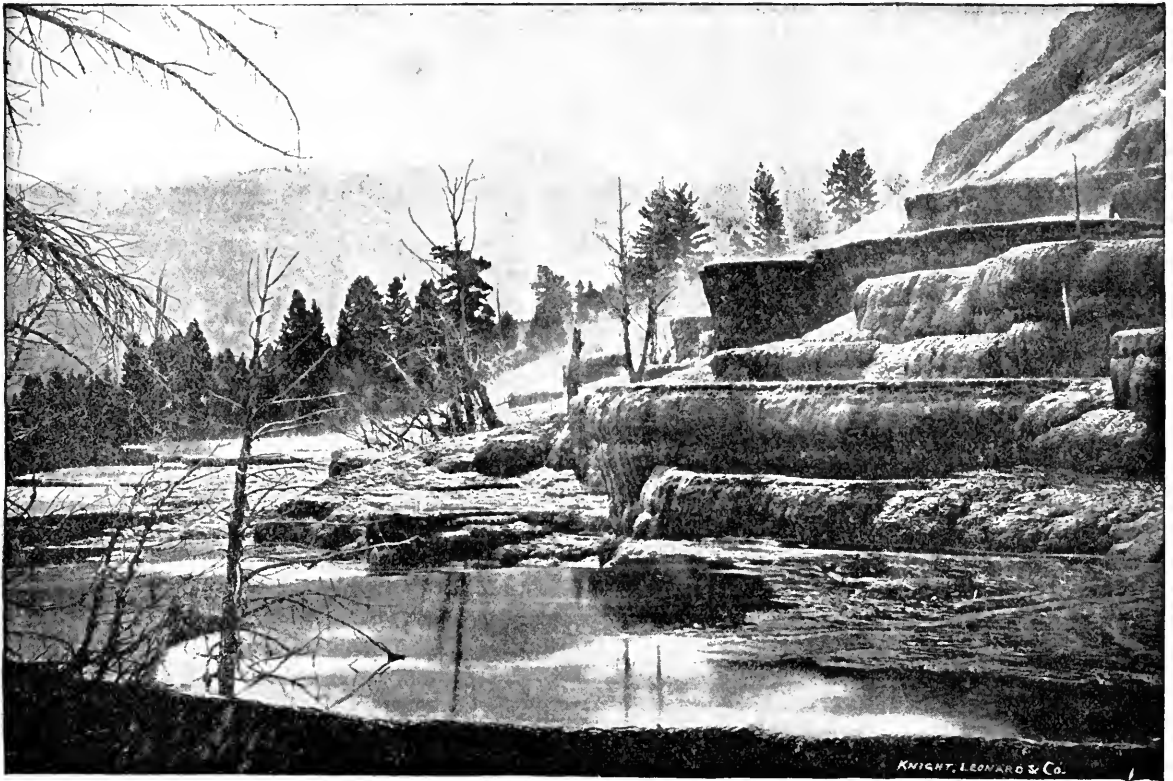
**The Men
of
Utah.**

No attempt is made in this editorial review to deal with the many and pleasing personalities who came to the front in the deliberations of the Third National Irrigation Congress. But there is a special reason why mention should be made of the delegation from Utah, "the cradle of American irrigation." It was headed by the Hon. George Q. Cannon, who was unanimously chosen temporary chairman, and who was received with hearty and long-continued applause on being presented as "a great representative of the most illustrious race of irrigators on this continent." In view of the place which Utah occupies in the history of irrigation, the convention delighted to honor the representative of the coming State. There is another reason why Utah should be given prominence, and this is, the fact that her industrial system is generally recognized as offering the best basis for the development of homes for the millions. This system was described very fully in Mr. Cannon's opening speech, when he told the story of the small farm, of land division and of the common ownership of water. The ideas which his people have practically illustrated are the ideas which are to prevail hereafter, and with their growth in popular favor, the virtues of the Mormon people are certain to shine with deserved luster, while many unpleasant recollections will be softened or forgotten. The Wyoming incident, on whose account Governor Osborne and Mr. William Penn Rogers, of California, experienced hysterics for a year past, did not materialize at Den-

ver. Elwood Mead was chosen President of the Congress, while the chairman and secretary of the National Committee, the other objects of the gubernatorial spleen, were handsomely reëlected. This is the quiet but effective answer of the irrigation movement to the ferocious governor and the estimable gentleman from California.

The Denver Committee. No one who has not himself experienced the work involved in making the preliminary arrangements for an important convention can appreciate the debt which the irrigation congress owes to the local committee at Denver, and especially to Chairman E. W. Merritt and Secretary Thomas L. Smith. These gentlemen and their colleagues labored assiduously for

several weeks to perfect the arrangements for the Third National Irrigation Congress and to give the event the widest publicity. Their agreements were fulfilled to the letter, and members of the national committee, particularly, are indebted to them for courtesies received. Mr. Smith was appropriately honored by an election as secretary of the congress. The elaborate excursions planned by the committee failed only because there were not a sufficient number of delegates who had time available for the entire program, but the delightful day spent at Greeley, Fort Collins, Longmont and Boulder and the festival day at Rocky Ford will never be forgotten. They were practical revelations of the results of irrigation applied to good soil.



PULPIT TERRACES, MAMMOTH HOT SPRINGS, YELLOWSTONE NATIONAL PARK.—reached via the Union Pacific System.

To the People of the United States.

THE Third National Irrigation Congress, assembled at Denver, Colorado, September 3-10, 1894, sends greeting to the people of the United States.

One year ago at the session of this Congress held in Los Angeles, California, we provided for the creation of unofficial irrigation commissions in seventeen States and Territories, charged with the duty of investigating the physical conditions of the arid region and formulating the views of their constituents as to needed legislation, National and State. By this means we hoped to harmonize conflicting opinions and find the basis for a just compromise between extreme views of public policy. With the reports of those commissions as the material for study and debate, we hope to be able to suggest at this time a national policy, broad, just, comprehensive, statesmanlike. We are dealing with problems that involve the happiness and prosperity of millions of freemen, the tranquillity of States, the evolution of new conditions of society and of higher forms of civilization. As the result of the faithful work of the unpaid but patriotic men composing our several commissions, we have arrived at conclusions upon which we believe all Western men can unite with reasonable unanimity, and which it is our purpose to present to our countrymen, from the platform, through the press and at the fireside until their triumph is complete.

These conclusions are given to the press simultaneously with this address, and will be framed for presentation to the Congress of the United States at the proper time.

The fundamental idea of our policy is not the separation of State and national interests, but coöperation between these powers within their proper spheres. The great end in view is to reclaim lands now useless and make them fit to sustain a vast population under conditions which shall guarantee industrial independence and human equality. We recognize these public lands as the heritage of the American people, not as the spoil of private greed. We aim to deliver to the people this precious birthright under conditions which will burden them only with the actual cost of reclamation and the return of the capital actually employed in the work, principal and interest. We recognize no private monopoly in the water which is the life current of the field and hence of the man who lives thereon. We seek to inaugurate a policy which will settle interstate water contentions in a spirit of justice and equity. We aim to preserve and protect the forests and so to control the pastoral lands that the barbarism of frontier warfare shall be forever eliminated and this portion of the public domain made useful to the largest number of people, under conditions which guarantee security. Upon these lines we hope to inaugurate a new era of industrial development, finding employment for labor and capital and security and satisfaction for both.

But while we are about to urge the necessity of important and far-reaching legislation, we do not forget to thank the Congress and the people of the United States for what they have already done for Western States and Territories. We remember with gratitude the wise and patriotic action of President Harrison in establishing large forest reservations and urge the continuance of this policy by President Cleveland. We heartily endorse the plan of Prof. Sargent of Harvard University, providing for the education at West Point of skilled foresters, for a local forest guard and for the use of detachments of United States troops in guarding forest areas. It is impossible to exaggerate the importance of forest preservation to the economic life of Western America, because of its intimate relation to water supply for irrigation.

We also note with satisfaction that a bill donating to each Western State, under conditions, 1,000,000 acres of arid lands for purposes of reclamation, recently passed the United States Senate unanimously, passed the House with only nine dissenting votes and received the prompt approval of the President of the United States. We interpret this remarkable unanimity of action as an evidence of confidence in Western men, of real concern for Western institutions. And it is our purpose to avail ourselves of the opportunity thus given, and to make the Carey law the first step in the development of a great internal policy.

We thank Congress for such appropriations as have been provided for the work of gauging streams and in investigation of water supply, but urge that larger appropriations are needed.

But while we ask such national assistance, in the way of legislation and appropriations, as the dignity and importance of the interests involved clearly demand, we assure the people of the United States that we propose to help ourselves. Our unpaid State commissions will again be organized for the purpose of securing helpful State legislation and providing liberal State appropriations for the work of scientific study of our problems, and for carrying on good administrative systems.

We especially urge our countrymen to remember that in the true sense the problems of the Irrigation Congress are of national dimensions and national import. The best solution of the difficulties that vex our statesmen and economists is that solution which would provide idle, discontented or unprosperous people first with labor and then with homes. Our panacea for existing unrest is the small, irrigated farm, producing what the family consumes as well as a surplus for market and giving to its occupants, by reason of its smallness, the benefits of neighborhood association. We ask only the opportunity and facilities to provide such homes for millions and so erect great States on what is now the voiceless desert. And this we seek to do in the name of our nationality, not in the name of individual States or sections. We know no flag except the flag of the Union. We know no destiny except the destiny of the American people. And whatever we shall accomplish under the policies we announce will add directly to the glory and greatness of our common country.

MEMORIAL TO CONGRESS.

"Your memorialist, the Third National Irrigation Congress, in session at Denver, Colo., begs to call your attention again to arid and sub-humid America, and to represent in relation thereto, as follows:

"That the subject of irrigation comprehends a most fruitful field of national legislation in behalf of home-seekers.

"That about two-fifths of the total area of our whole country is without a sufficient rainfall to make it habitable, and therefore, if it is to constitute the homes of a happy people of the present generation or of generations to come, it must be irrigated.

"That the great work of discovery and distribution of our waters, which must precede the intelligent location by the home-seeker and the actual work of reclamation, is too great and expensive to be most comprehensively undertaken by individuals, and this Congress, therefore, most respectfully but urgently petitions you to make adequate appropriations for, and to have conducted in the most comprehensive and practical manner, an irrigation survey in charge of experienced and competent irrigation engineers. We also urge that as such work progresses you enact such laws and repeal such old ones, if any, as may be necessary to meet the conditions found to exist as the result of such survey."

THE DENVER PLATFORM.

NATIONAL LEGISLATION.

THE National Executive Committee of the Irrigation Congress is hereby instructed to prepare a series of bills for presentation to the Congress of the United States, embodying the following propositions:

1. Repeal of the Desert Land Law.
2. That there shall be appointed a National Irrigation Commission vested with the supervision of such irrigation works as may be constructed by Federal Government. The National Irrigation Commission shall also be charged with the work of making an immediate investigation of the problem of interstate streams, and recommend to the Congress of the United States as early as possible a measure providing a means for the speedy and final adjudication of questions between States and a plan for the division of streams on a basis of justice and equity.
3. That the several Territories be included in the provisions of the Carey Law.
4. That sufficient appropriation be secured from the general government for carrying on the work of discovering waters, applicable to the reclamation of the arid lands, and for the prosecution of surveys necessary to determine the location of lands susceptible of irrigation, and the selection and segregation of reservoir sites.
5. That reservoir sites heretofore reserved by the government shall be released and made available upon application therefor by States and Territories.

STATE LEGISLATION.

The rapid growth of irrigation development demands that steps be immediately taken to reform the present loose and diverse methods prevailing in different States, and to devise effective administrative systems upon some basis of uniformity. In order that these and other pressing questions may be immediately taken up for discussion and settlement, the National Executive Committee is hereby instructed to create a system of State Commissions, acting under the authority of the Irrigation Congress and appointed on the basis laid down in the Los Angeles declaration. These State Commissions are hereby instructed to proceed upon the following lines:

1. Call State conventions as early as practicable to formulate legislation for the utilization of the Carey Law in those States to which it applies.
2. Devise plans for an effective administration system and present same to the executive and legislative departments of the State government not later than January 1st, 1895.
3. Consider in connection with the above the administrative systems of Wyoming and Colorado, the suggestion for the incorporation as bodies politic of water divisions consisting of grand hydrographic basins, and the district law of California. In connection with the latter, attention is called to the urgent suggestion contained in the report of the California Commission, favoring stringent State supervision of districts.
4. The State Commissions are advised to favor the construction of works by States under the Carey Law when practicable, and are most urgently advised that when lands are reclaimed under said law by private companies the State should fix the maximum price at which such lands shall be sold.

THE MIGHTY COLORADO.

AN ACCOUNT OF THE DISCOVERY, EXPLORATION AND CHARACTERISTICS OF A FAMOUS RIVER OF ARID AMERICA.

BY J. A. YOUNG.

MUCH has been written about the Colorado river, now so famous on account of the deep winding ravines through which its turbulent waters flow. History informs us that this river was discovered in 1540 by some Spanish explorers. Sitgreave's expedition, in 1851, crossed the Colorado about one hundred and fifty miles above Yuma. On New Year's day, 1854, Lieutenant Whipple, when making a survey for a railroad, came in sight of high cliffs in the vicinity of this river and subsequently made discoveries relating to the existence of the Grand canyon. The War Department sent out an expedition under Lieutenant Ives, in 1857, to explore the Colorado as far as found safe and practicable. He ascended the river to within a few miles of the Virgin. Previous to this time, and for many years after, the true source and exact course of the Colorado were not definitely known. In a general way, it was understood that several hundred miles of its channel lay in deep gorges. At many places along its course it was hazardous to approach the rim of the channel, much less descend to the edge of the water. It was generally believed that its course was beset with numerous rapids, falls and whirlpools, over which boats could not safely pass, and that for hundreds of miles this river disappeared and ran beneath the surface of the earth. It was taken for granted that certain death would be the fate of any one attempting its navigation. We are told that James White, an unsuccessful prospector, and a companion took refuge in the Grand canyon in order to escape from the Indians. Numerous romantic adventures were narrated from time to time, by persons who claimed to have invaded the mysteries of the Grand canyon, but for the most part that river remained unknown to the geographer.

MAJOR POWELL'S EXPLORATION.

In 1869, Major J. W. Powell undertook the exploration of the Colorado. He left Green River city, on the Green, in Utah, May 24th, with nine men and four boats, and on August 30th, landed at the mouth of the Virgin, more than one thousand miles, by the river's channel, below the place of starting. One of his men abandoned the expedition at an Indian reservation agency, before the party reached Arizona. Three more, after encountering unprecedented terrors for many weeks, having made many hair-breadth escapes, preferred to risk the perils of

an unknown desert rather than face "grim death" any longer. They abandoned the expedition and were killed by Indians.

In order to more fully comprehend the dangers of such a voyage, we must consider that this river has a fall of about 5000 feet in 500 miles. It is beset with hundreds of rapids and cataracts, and along its channel there are numerous short turns or angles. There are hundreds of projecting and overhanging rocks; on the right and on the left many obstructions rise up here and there to break the direct current, and there are hidden snags and sandbars at frequent intervals, all of which combine to make a safe voyage almost impossible. It was one of the most venturesome voyages ever made on inland waters. Major Powell's graphic description of his adventures entitled, "An Exploration of the Colorado River of the West," is a story of true heroism. It portrays trials and hardships that none but a true patriot and soldier would be likely to endure. The conquest that he and his companions gained, in this exploration, is even greater than one that is won on the battlefield. In his official report he describes the Colorado with its canyon walls in this terse language: "Ten million cascade brooks unite to form ten thousand torrent creeks; ten thousand torrent creeks unite to form a hundred rivers beset with cataracts; a hundred roaring rivers unite to form the Colorado, which rolls—a mad, turbid stream—into the Gulf of California."

THE GRAND CANYON.

The Grand canyon lies almost wholly in northern Arizona, and for the present is not accessible by any railroad, the nearest station being Flagstaff, Arizona, on the Santa Fé route, from whence a stage line runs to the canyon; hence comparatively few persons have had an opportunity to behold this sublime spectacle. Geologists and others differ in regard to the length of the Grand canyon and the extent of the "Grand canyon district." The Grand canyon proper is about 220 miles long. The Marble canyon, which is really a part of the Grand canyon, is about 70 miles in length, making in all 290 miles. There are scores of other streams that join the main river, each of which has its canyon. Each of these again is subdivided into other "barrancas" that intersect it, making altogether hundreds of gorges. The gorge of Niagara would sink into insignificance when compared with

any one of them. The Colorado and its affluents have cut their way through an extensive plateau, or series of elevated table-lands, known as the "Great Plateau Region." At some points the walls of the canyon rise sheer from the water, at other places there are tali of rocks, and occasionally a narrow strip of fertile bottom land on either or both sides.

It is acknowledged by all that the Grand canyon affords the greatest natural attractions and diversified picturesque scenery there is in the world. It is certainly the "wonder of wonders," and is a geological phenomenon that has no equal. When compared with other canyons it may appropriately be called the "Mammoth canyon." It must be seen in order to be appreciated. Imagine yourself standing on the margin of a chasm, a yawning abyss in the earth, where you can look down 6,000 or 7,000 feet—nearly two miles deep—and to the opposite rim from three to twelve miles distant. Clarence Dutton's magnificent Atlas and Supplementary Atlas Sheets fall far short of giving an adequate idea of the vast ramifications and astonishing variety and inspiring grandeur of nature's noblest work, "The Grand Canyon of the Colorado."

THE COLORADO RIVER.

The Colorado is one of the largest rivers in North America. It is formed in north Utah by the confluence of the Green and Grand, flows southwest, intersecting the northwestern corner of Arizona, then turns and flows south, forming a part of the eastern boundary of Nevada and California, and empties into the Gulf of California. As a whole, in connection with its tributaries, it drains a territory of about 300,000 square miles.

ABUNDANT SUPPLY OF WATER.

The supply of water for the rivers flows from a region of vast mountain ranges, many of them covered with snow that gradually thaws from early in the spring till late in the summer season. Along the course of its elevated headwaters there are frequent and heavy rainfalls during the warmer months. Thousands of never-failing springs along its course afford a gradual and constant supply of water. As has been stated, this river for the most part flows at the bottom of a deep channel, and its bed is chiefly of solid rock, hence but little water is absorbed by the earth. Much of the surface of the water is hid from the direct rays of the sun by the towering walls of solid rock, so that but little of its volume is wasted by evaporation. Along the course of its channel, before it reaches the Nevada line, but little of its water can be used for irrigation purposes. In view of these facts, it can be seen that this stream affords, comparatively, a very large, regular and inexhaustible supply of water. If properly diverted it can be made more valuable for irrigation purposes than any

other river in the arid region. This stream is considered by experts to be particularly valuable for irrigation on account of its fertilizing qualities. It is said to be equal to the river Nile in that particular. The opportunities this river affords for developing water power are not surpassed by any other stream.

MILLIONS OF ACRES AWAITING IRRIGATION.

On both sides of the Colorado, below the mouth of the Virgin, more especially on the west margin of that river, there are millions of acres of desert land, which only requires the application of water to make it productive. The rainfall is very light and occurs at the time of the year when it is least needed. There are numerous small mountain ranges, but for the most part the land is well adapted to irrigation. The foothills of the mountains adjacent to and leading out from the Colorado afford most excellent facilities for constructing gravity ditches, having the necessary elevation for irrigating the lower and fertile lands. There are but few streams that can be relied upon for irrigation. Artesian wells may afford a limited supply of water. To the casual observer it would appear that the relative altitude of the Colorado and the bordering lands is such that but a small proportion of this country could be irrigated from that river. There are, however, numerous places some distance west of the river where the land is below the sea level and also below the level of the Colorado.



A POSSIBLE CANAL ROUTE.

According to the reports of the United States Geological Survey, the lands in the southern part of Lincoln County, Nevada, adjacent to the Colorado, are mainly 1,000 feet or more above the river. At points below the mouth of the canyon there are a few localities where valley lands of lower altitude are to be found, notably the Cottonwood valley and Mohave valley, but these are relatively of small extent. In the eastern ends of San Bernardino and San Diego counties, California, the land has a less elevation, and a large portion of it could no doubt be irrigated by diverting the Colorado river. In the latter county is located what is widely known as the "Colorado Desert," a part of which lies much below the sea level and also below the channel of the Colorado at that point. The unproductive part of the desert, known as "Dry Lake," could be filled and replenished from the Colorado, and a large area of arable land on its margin irrigated from the same source. If this should ever be accomplished, the following lines will no longer fittingly apply to the famous Colorado Desert:

"A purple sheet of cloudless sky
That bends with downward slant to meet
Gray, shifting sands, that silent lie
Becalmed beneath the awful heat.
No green blade springs in that sad land,
No bird-wing beats the heavy air;
The marvel of a blighted hand
Vast, silent desert everywhere."

The necessary works for irrigating, however, must be of the most expensive character, on account of the great floods in the Colorado and the difficulties of maintaining headworks of a permanent character where the canals and the river have about the same altitude. Near and below the Mexican line the proportion of low or mesa land increases, and from data now at hand it seems probable that a large canal heading in the United States territory, some distance above Yuma, on the east side of the Colorado, can be made to cover extensive areas near the border line. Why should an abundant supply of water be permitted to pass these lands and have so little use made of it for irrigation purposes? Must that vast domain remain a "barren waste"? Is it not possible to redeem a portion of it at least? At present the land is useless and the water is useless. "A barren waste" and "an aquatic waste" are incompatible terms when applied to this desert country with the Colorado flowing through it.

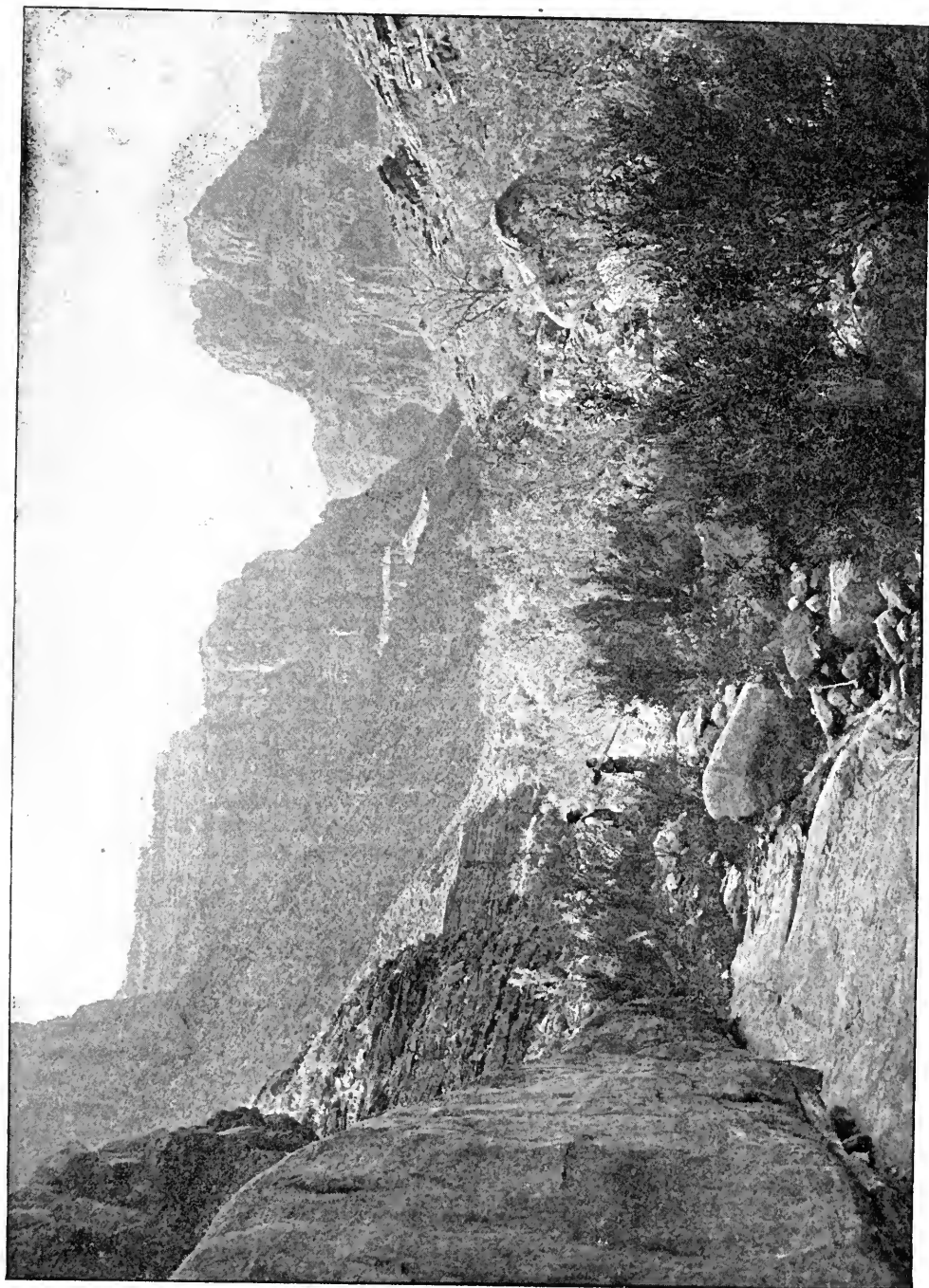
WHAT MAY BE ACCOMPLISHED.

In view of the statements given above is it not possible to make the water of the Colorado more available for irrigation in order to develop the resources of that section of the country? At certain points where the relative altitude of the land and river and other conditions are favorable, dams could

be erected. Doubtless, in some places, these dams would give the water sufficient elevation for entering flumes or channels that would conduct it directly to the land to be irrigated. If dams were erected, power could be obtained for elevating a portion of the water to any desired height, so that it could be conducted to the foothills, mesas and other lands. Water raised by hydraulic power would give a regular supply which could be conducted directly to the land or to reservoirs. This method would not be subject to the usual disturbances caused by the rising and overflowing of the river. Where the land to be irrigated is barred by hills or bluffs, tunnels and syphons could be used.

"Death Valley," in Inyo county, California, is also below the sea level. There are thousands of acres of arable land in the vicinity of the celebrated "Dry Lake," lying below the level of the Colorado. Would it not be a good investment to erect a dam at some point along the course of the river, and cut a channel that would divert its elevated waters so that "Death Valley" may be filled, and the surrounding desert reclaimed by irrigation? At times when there are great floods in the Colorado the excess of its waters could be conducted into this and other "dry lakes," which, if filled, would be vastly beneficial to that desolate country. Possibly places could be found where water could be held or stored for future use. If the surplus waters were thus drawn from the Colorado, the irrigating works and cultivated valley lands; where the bed of the river and the surrounding country are on about the same level, would be protected from its frequent and destructive overflows. Doubtless if "Death Valley" were filled, the water would make its way on the surface or through subterranean passages to the other "dry lakes" in that vicinity.

Col. J. C. Fremont recommended that the government appropriate sufficient funds to defray the expense of cutting a channel so that "Dry Lake," in the Colorado desert, could be filled from the Pacific ocean or from the Gulf of California. No doubt he was well informed in regard to the advantages that would result from such an enterprise. A number of others from time to time have suggested the same project. If "Death Valley," "Dry Lake," the "Sink of the Mohave," and other depressions that abound in this desert country, could be filled with water and the surrounding lands irrigated and improved, it would have a powerful influence in modifying the climate in that section of the country. The effect would be the maintenance of an equilibrium of temperature by rendering the atmosphere cooler in summer and warmer in winter. The constant evaporation from the surface of the ground and inland lakes would promote rain and dew fall. That hot, dry



SCENE IN THE GRAND CANYON OF THE COLORADO.

desert country would no longer be an incubator for hatching sandstorms, so annoying to the people of southern California. What are now barren desert valleys would be transformed into beautiful gardens of fruits and flowers, of which it may yet be said:

" Knowest thou the land where the lemon trees do bloom,
And oranges like gold in leafy gloom,
A gentle wind from deep blue heaven blows,
The myrtle thick, and high the laurel grows?
'Tis there! 'Tis there!
O, my beloved one, I with thee go!"

Power could be obtained from dams for generating electricity, which could be conducted to various places, many miles distant from the river, for operating electric motors to be used for pumping water, running factories, street cars, mining machinery, etc. This power could be used for illuminating purposes also. The Falls of Niagara is about to be utilized as a source of power. It has been merely an object of wonder, a natural curiosity; it will soon become a greater wonder, because it will furnish thousands of horse power to promote the industries of man. The Grand canyon is one of the greatest wonders in nature. If the waters of the Colorado can be extended to promote irrigation, in the ways suggested, that river will be a source of greater wonder. The river Nile, as it emerges from the unknown labyrinths of the wilds of "Darkest Africa," performs wonders in the way of irrigating "The Valley" that would otherwise be a desert. Why should not the Colorado, after it abandons the dark recesses of the Rocky Mountains and the Grand canyon, do as much, and perhaps more, than the Nile? No doubt great progress will be made toward reclaiming this section of the country. To consummate a scheme of this kind will require a great deal of capital. While these improvements are under way employment would be given to thousands of men. If this section of the country should be improved in the way suggested, it would furnish homes and subsistence for millions of people.

A GRAND CANYON RAILROAD.

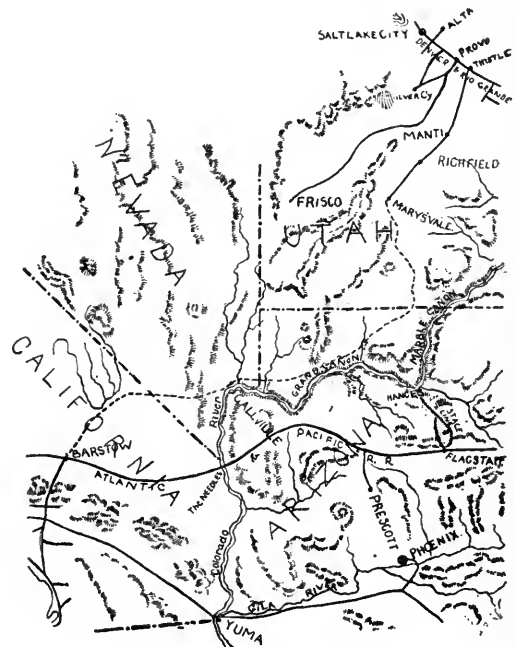
As has been stated, there is no railroad leading to the Grand canyon. Several years ago a preliminary survey was made for a road leading out from a point on the Atlantic & Pacific. The parties interested in it did not receive the support they expected, hence the matter was abandoned, although they claim the enterprise would have been a paying one from the beginning. It is to be regretted that the grandest work of nature in the world has no approach that meets the demands of the traveling public. There are few persons who are willing to undergo the hardships and defray the necessary expenses of an outfit belonging to an expedition having the usual equipments of a camping outfit, including pack-animals and guides, or a day's ride in a stage coach.

A few years ago an enterprising capitalist had a

survey made along the course of the Colorado river, with the view of constructing a railroad which would give a more direct route to the Pacific coast. By referring to maps of southern Utah, northern Arizona and southeastern California, bordering on the Colorado, it will be seen that there is no other section in the United States that presents a better opening for a railroad.

The people in southwestern Utah and in the southern extremity of Nevada have frequently petitioned and have waited long and patiently for a railroad that would place them in communication with the outer world. That particular locality, with its natural advantages, is already reported to be "An Eden," and doubtless will become "the paradise of America" when fully reclaimed by irrigation and proper railroad facilities.

A more direct route leading from Denver to Los Angeles and the Pacific coast is wanted. This may be consummated by having a line leading out from some point on the Denver and Rio Grande and extending through southern Utah, following the general course of the Colorado river to the southern part of Nevada, and thence southwest to the Pacific coast. A line extending south from Salt Lake City and intersecting the one named would also place that city in direct communication with southern California. In order to make this system complete it should pass through the Grand canyon district, and be operated in connection with a plant that would afford proper



PROPOSED RAILROAD.

facilities for visiting the Grand canyon proper at some point that would be considered the most attractive and interesting.

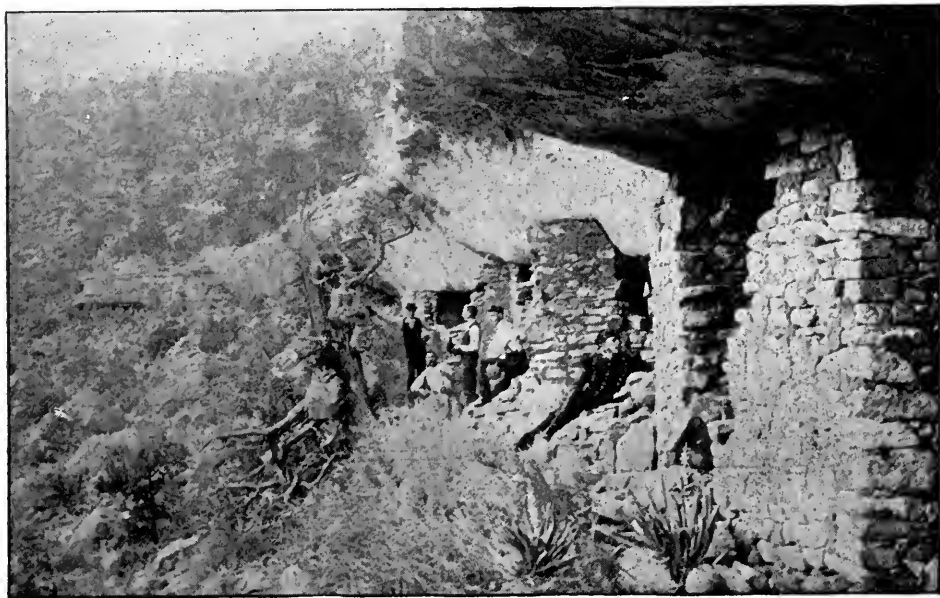
The nineteenth century is preëminently an age of great engineering works and vast enterprises. Ascents are now made by rail to the tops of some of the highest mountains, affording the scientist and lover of nature satisfactory views of the world's geological phenomena. It is hoped that in the near future the Grand canyon and its surroundings may be visited without fatigue and unnecessary waste of time and outlay of money.

As has been stated, the Colorado river has a large and inexhaustible supply of water, capable of furnishing more water power in its numerous cataracts along its course through the Grand canyon than any other river. A plant could be established that would afford power necessary for running dynamos, from which electricity may be conducted to motors to be used for operating cars, elevators, etc. By means of an elevator, or incline, a high point could be reached which would give an extensive view of the surrounding wonderland. A single electric rack railway incline, or a system of elevators combined with inclines, could be constructed and operated so that the water's edge could be safely and comfortably reached. Boats could run by electricity on a portion of the river, which would give good views from the depths of the "inner gorge." A trolley line, a few miles in length, operated on the margin of the river or valley ground, would serve the same purpose. A similar line, operated on the rim of the canyon would add materially to the facilities for making observations. Perhaps water

power could be applied directly to machinery, operating inclines without introduction of electricity. Ample power could be obtained from the Colorado to operate an electric road extending hundreds of miles along its course, especially in the Grand canyon district. Relay plants for generating electricity could be located at such places as would be necessary to furnish power for an electric trolley system, or for engines run by storage batteries. This power could be made available for electric lighting, and also for compressing air to be used for mining and manufacturing purposes generally.

The Denver and Rio Grande railroad and the Santa Fé route are now celebrated as scenic routes, and, if extended to the Grand canyon district, they would become still more popular in that particular. A road leading to the Grand canyon would have advantages over all others. It would be the means of forcing travel both ways. It certainly would be a good road for both business and pleasure, and would receive a large share of patronage, and hence be profitable to its stockholders. In that section of the country there are extensive mining interests already established, which would be more fully developed. New mines would be opened and other interests would be promoted in like manner.

It is to be hoped that enterprising capitalists will take hold of this matter, and that a road will be built along the channel of the Colorado, in the vicinity of the Grand canyon. An achievement of this kind will be in harmony with the enterprising spirit of the present time.



CLIFF DWELLINGS IN THE GRAND CANYON.

PUBLIC OPINION AND THE IRRIGATION CONGRESS,

AUTOGRAPH COMMENTS OF PROMINENT DELEGATES.—EDITORIAL
REVIEWS BY LEADING NEWSPAPERS.

IN my judgment its assembling was not wholly in vain. It put at rest, at least for a reasonable time, the interested and greedy cry for a cession of the arid lands to the several States in which they are located. It declined to absolve the government, the paramount land owner, from its duty to improve its own estate and make it a fit dwelling place for the landless, homeless, laborless and hopeless people who now overcrowd our great cities and threaten the peace and perpetuity of the nation. It plainly announced that the time had come when the general government should use some of its revenue to survey the arid lands; to investigate the great question of water supply, both surface and subterranean, to the end that these lands may be reclaimed, if means for such reclamation can be discovered. Each year Congress appropriates millions of dollars to repair the damage occasioned by a superabundance of water in the Mississippi river. Let it appropriate a few millions for the establishment of reservoirs in our mountains, to the end that the very waters that yearly swell the volume in the Mississippi and produce such ravages may be used to fertilize our plains and make them habitable for man. In the East they have too much water; in the West it is suffered to go to waste for want of storage facilities. If it is right for Congress to legislate with respect to the question of too much water in the East, why is it not its duty to legislate with respect to water in the West? The question of too much water and too little water, like the blades of the scissors, turns on the same pivot.

If the Irrigation Congress will confine itself to the few questions which at once suggest themselves to practical men, and ignore those that hold in their bosoms jobs and real estate speculations, it can accomplish very much for this generation. At best its work is simply advisory and suggestive. Why attempt to define any policy touching the disposition of the arid or sub-arid lands until you have first ascertained whether water can be had for their reclamation?

If water cannot be found to restore them to fertility, it is a matter of very little importance who owns them; that is, whether they remain with the general government or with the State. Let the next Congress stand on the platform adopted by the recent one. Emphasize the duty of the government to investigate the primary question of water supply, and I feel assured that some good will result.

After it is demonstrated that there is an abundant supply of water, we can then take another step and determine whether the general government or the State, or both conjointly, shall carry on the work of reclamation.

Let us first catch our hare and then we can leisurely discuss the method of cooking him.

THE Third National Irrigation Congress,* while accomplishing many things, impressed me more as a consulting body of men, strongly imbued with a single idea, than anything else. The work of the congress will probably be shown in the future in the presentation of bills to the national Congress asking for legislation on various subjects germane to the irrigation idea, and the Address to the People, issued by the congress, will undoubtedly arouse widespread interest in the work which the irrigation leaders are endeavoring to accomplish in the West and in the East, but the principal beneficial result of the congress, as I view it, will come from the interchange of thought among the delegates from the various States.

Necessarily among so many bright men there are enthusiasts who believe that there can be only one view of any public question, and that is the one they hold. Coming from a score of States and Territories, there are naturally many of these enthusiasts, and it surprises them to discover that they do not agree. To meet other men, just as earnest and just as enthusiastic, but looking at the main question from a different standpoint, must be productive of benefit to every man who attended the congress. The friction of sharply opposing minds developed many new ideas, and the comparison of notes among those of harmonious views strengthened many in the opinions they held.

The congress had to deal with many things, but the chain of its labors was composed mainly of these three things: Arid lands, wasting waters, homeless people. How best to make homes for millions out of these three elements is the problem confronting the men of the West. To work out such a problem alone is beyond the power of a single human brain. To discuss it in the press and from the platform is of great assistance to any student of this great question. But better than all else is for the leaders to come together in a congress and sit down and discuss all phases of the question as brothers working for a common end. To get acquainted with the motives inspiring each man working on the problem, to eliminate from it all minor points of difference, and to agree, as nearly as practicable, on the one great issue, are things which could only be accomplished by such personal intercourse as this congress afforded.

Viewed in this light, the Third National Irrigation Congress was a very great success, and the result of its deliberations must be of benefit, not only in a financial and practical sense, to the arid States and Territories, but to the constantly increasing thousands of our homeless fellow countrymen in the congested cities of the East, who are looking hopefully to the West for a solution of the despairing problem which now confronts them.

James. B. Belfrage

Of Colorado.

Irvin R. Allen

Of California.

IN the West popular sentiment is unanimously in favor of the early reclamation and settlement of the arid lands.

Believing that the national government is either unwilling or unable—or both unwilling and unable—to undertake this reclamation, a large portion of the people have advocated the cession of the lands to the States. This plan has been opposed by many whose objections are mainly of two classes: First, that if the lands were ceded, the disposal of them would be under corrupt influences; second, that if the lands were ceded the several States would be prevented by constitution limitations or lack of credit from realizing any benefits from such cession. This congress undertook to formulate a plan whereby the consent of the government might be obtained, and the capital secured for the work of reclamation. In this respect it failed; in some other directions its work was more successful and may result in good.

The first resolution, if strictly carried out, will work a hardship to Arizona and other portions of the truly arid region. Without doubt there have been abuses under the Desert Land Law, but it should not be repealed until there is something better to take its place.

The principle of the resolution asking for the creation of a National Irrigation Commission is an excellent one. The welfare of the whole West requires that questions pertaining to irrigation should be studied by men who are familiar with the conditions which exist, who recognize the necessities to be met, and who are qualified by technical training and experience to handle these questions intelligently. Congress should be urged to make appropriations on a most liberal scale for the work of this commission.

Beyond a reasonable doubt much good land will remain when every available drop of water has been utilized. In any locality, therefore, the problem of irrigation depends mainly on questions of water supply. To fully determine these questions will require years of scientific observation and experiment; the cost of this work is beyond the means of corporations, or even the States. This investigation should be resumed at once, *and continued without interruption.*

The resolution in favor of extending to the Territories the benefits of the Carey Law and such other legislation on irrigation as may be obtained is one of simple justice. Legal reasons why this cannot be done may exist; but if there are none, the Territories should not be compelled to await their admission as States before commencing a work of such pressing importance.

The adjustment of international interests requires the services of special commissions, formed under treaties between the nations concerned.

The present movement for irrigation extension had its origin in the desire to reclaim from the desert the vast extent of arid land, which without irrigation will always remain worthless, except possibly for grazing, and which with irrigation will be capable of supporting millions of people who otherwise will never possess homes of their own. If any progress is to be made toward the attainment of this object, it will be made by keeping the control of this movement within the limits of the arid region, and not by handing it over to States which have no real interest in it.

Edward M. Boggs,

Of Arizona.

THE irrigation movement in the United States—it certainly has attained the dignity of a "movement"—has thus far been largely educational in character, so far as the major part of our population is concerned. Although the best evidences afforded by history and the remnants of ancient civilizations indicate that irrigation antedates drainage, in the progress of mankind from the root-grubbing, nut-eating, savage state up to civilization, and has in all ages supported, and still supports, a large proportion of the world's population, yet it is to our people, as a whole, something new, and largely regarded as experimental and of doubtful, undemonstrated value. Details, constructive, administrative and practical, have had to be mastered by the individual, and the first and greatest steps of all in the general work of reclaiming the arid lands of the United States have been informing and convincing the American people what irrigation is, what it is worth, what it will accomplish. These are lessons learned slowly and with difficulty by those who, for many generations, have depended upon the fitful and so often disappointing dole of the clouds.

The Denver Congress will, I believe, prove a historic milestone on the highway of irrigation progress, more because of its value as an educator in the larger sense, than for any other reason. The preparations for the congress, its sessions and conclusions, have doubtless done very much to nationalize irrigation interest and call the attention of the whole people to the home-building possibilities of the great arid region, and while its effects in shaping a broad and uniform national irrigation policy may not prove so forceful as hoped for, yet its influence in this direction will, I am persuaded, prove broad and deep.

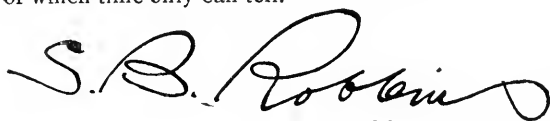
J. W. Gregory

Of Kansas.

TO speak of the outcome of the Third National Irrigation Congress recently held at Denver, with regard to all phases of the subject in Montana, without mentioning the other States, would take up too much space. It seems to me that the most important objects accomplished were, the continuation of the National Executive Committee, with instructions as to what their work shall be for the coming year, a general discussion of the needs of the West, and a separation of the questions upon which the different sections of the arid region do not agree, leaving them out for the present, agreeing on certain fundamental principles, and *getting to work* with a solid front to secure what we have determined we are agreed upon. Another object gained, was a thorough understanding by the people of the different States of the Carey bill, and the benefits obtainable under it through its proper application.

To secure these benefits for their States, the new State Commissions have a very important work upon their hands. In every State, with perhaps the exception of Wyoming, to take advantage of the million acres donated under this new law, there must be a considerable new legislation enacted by the State Legislature, and a good deal now in force must be repealed. To do this wisely and effectively will require a thorough knowledge of local conditions, the existing laws of all the arid States, and hard work on the part

of the commissions. It is from these commissions that I think we will receive our first tangible results of the Denver congress, which will undoubtedly leave an influence upon the whole country, the extent of which time only can tell.



Of Montana.

THE Denver congress marks a long stride in advance by the irrigation sentiment of this country. Eleven months ago, when the congress met at Los Angeles, only some half dozen States, outside of California, had representatives in that distinguished gathering of the friends of irrigation. Every State and Territory in Arid America appeared through full and able delegates at the Denver meeting. In addition to this, Missouri, Illinois, Wisconsin, Minnesota, Georgia and Rhode Island sent good representative delegations, thereby showing a growing interest in other States than Arid America in the matter of reclaiming the western half of our domain. Mexico on the south and the Dominion of Canada on the north also appeared and greatly added, by their counsels, to the net results achieved by this gathering of the people. The discussions, the papers read and the general trend of thought clearly showed that the old idea of ceding the arid lands to the several States was distasteful and would never be consummated. Whether the Carey law would ever be carried out, seemed indeed to be in very great doubt as applied to Arid America in general.

The people want places to make small homes without buying such homes from syndicates and aggregated capital. This the American people will have. Small holdings for the million of young men yearly arriving at their majority is, from this time onward, to be the rallying cry, and this cry will be heeded and will, at last, get itself embodied into law. Another thing clearly may be gathered from our study of the doings of this congress, which is, that irrigation concerns not Arid America only but all the States. We do not now fully utilize all the waters we have. The humid States need, and they will have, a better distribution of their present water supply. As our population goes on doubling up every thirty years, we will make a wiser use of our flowing and underground waters. The problem of the imminent future is, how and by what methods shall *all* America economize *all* the waters the good Lord sends to us?



Of Kansas.

I WAS very much impressed, not only with the work which was accomplished by the Third National Irrigation Congress, which met in Denver from September 8d to 10th, but with the strong character of the personnel of the convention itself. I believe it to be one of the most representative bodies of men that I ever saw together, representing so many different States, nearly all of which had conditions which were different from the others, and nearly all of which had private interests which conflicted with the

others; yet, upon the whole, the convention itself was able to agree upon a policy, which, it seems to me, was the only one to be adopted at the present time.

The question of irrigation has passed beyond an experiment. It is admitted by all that in a very large portion of the United States it is an absolute necessity, in fact, would be a good thing anywhere. It is further admitted that intensified farming, small holdings and the owning of homes by the masses, are the things to be desired. To accomplish this it is necessary in the first place to have the very best kind of a survey that it is possible to make, and such experiments as will develop all of the water that it is possible to get in the arid regions, and to have these surveys and experiments of such a character as will show how the water can best be used to advantage, and placed so that it will do the greatest amount of service. I think this was aptly stated in the resolutions which were adopted by the convention, and the work of the executive committee, and in fact every one connected therewith, will be to the end that the necessary appropriations to carry on this work be obtained and the necessary steps be taken to accomplish it.

If such steps can be taken so that the work can be commenced before the next congress meets, the next congress will, I think, still have plenty of questions to grapple with, and they can take hold of them more intelligently than this convention could, because they will have a basis upon which to work.

No greater compliment could have been paid any one than the fact of the re-election of the editor of the IRRIGATION AGE as chairman of the National Committee for the next year. It recognizes the heroic work which has been done in the past as giving great promise of the results which will be accomplished in the future.



Of Nebraska.

CHICAGO TRIBUNE.—The Third National Irrigation Congress is the legitimate outgrowth of the first and second. In September, 1891, the first was convened at Salt Lake City, Utah. It was called to consider whether the arid lands should be ceded to the States or controlled by the national government. After a warm discussion, continued through several days, the Salt Lake Congress agreed by a large majority to recommend the cession to the State. The second congress was held at Los Angeles, Cal., last October. The question came to the front again, and as there seemed to be no possibility of adopting a policy upon which congress could unite, it was decided to appoint a commission from each of the seventeen States represented which should respectively investigate during the ensuing year the conditions in the States they represented, and formulate a national irrigation policy and a code of common State laws.

Since the movement began, it has gathered force and broadened until it seems destined to become national in scope. This public awakening is indicated by the warm interest that is taken in the matter of reclaiming the arid lands by many leading men of the East and of the whole country. The rescue of these lands for the people means more than crops

and realty values. Right in the midst of these lands, most advantageously interspersed, are mines of gold and silver, copper, lead, iron and coal. The mountain streams pour down torrents that create almost unlimited supplies of electricity, light, heat and power. Irrigation is the key that will unlock all the vast possibilities of the Western Empire. These arid soils are not Sahara sands as many suppose. On the contrary, they are as rich as can be found in the world.

The Denver congress is opportune now when the unequal distribution of population has aggravated the general distress, when eastern merchants are indirectly suffering from the wide-spread misfortune that has overtaken the western farmer through general drouth and scorching winds. The nation may listen now and be glad to hear of any solution of the conditions that have proven so defective and injurious in the last season.

NEW YORK TRIBUNE.—Seldom has any such assemblage been more timely than the irrigation congress which met at Denver. There is before the whole country an impressive object-lesson, inculcating the need of the very thing this convention is trying to promote. Both East and West have this year suffered, and largely still are suffering, from an intense and long-continued drouth. In Kansas corn has wilted and withered in the fields, and in New York and New England parched and shriveled fruit is dropping from the trees in showers. The sum of the losses sustained through lack of rain has not been reckoned, and may never be fully reckoned. But to say that it amounts to many millions of dollars is well within the bounds of soberness and truth. A more effective text could not be chosen by this convention for its deliberations.

It seems to be an established fact that, with the destruction of forests and other changes incident to increasing density of population, the water supply is, in these Eastern and Middle States, becoming less regular and trustworthy. Drouths and floods alternate. At times the rivers are almost dry, and at other times they overflow their banks. And both extremes are ruinous.

These evils are, we confidently believe, largely to be corrected by irrigation, conjoined with tree-planting and forest-conservation; and this belief is founded not on theory alone, but on actual achievements. Vast areas in the West, once sterile as the Sahara, are to-day rich and fruitful, because of the water which, gushing from artesian wells or brought through canals and flumes from distant rivers, trickles in thousands of tiny, artificial channels all over the land. Other vast areas, wind-swept and sun-scorched, have been made beautiful and salubrious by the planting of trees. Nor are similar examples lacking here, where rain does fall, and where trees naturally grow. Farmers here, or some of them, have learned the lesson, and have provided themselves with the means of watering their land whenever there is need of it. They may seldom need to do it; but when they do need it, as the Texan cavalier remarked, they need it mighty bad. The result is that in a season like the present their farms are literal oases in a desert of dryness and dust. It is high time all learned this lesson. The loss suffered by the average farmer in this one season amounts to as much as the cost would be of equipping his farm with appliances sufficient to make him practically independent of the weather.

BOSTON TRANSCRIPT.—The Irrigation Congress in session at Denver this week is unique in its principles and performances.

This congress is composed of delegates from every State and Territory west of the Missouri river. There have been two other similar irrigation conventions. The first was called by Governor Thomas, of Utah, and met in Salt Lake City in September, 1891. It issued a call for the cession of arid lands from the federal government to the several States and Territories. That has been done. The second irrigation congress was held in Los Angeles last October, and created commissions to form and formulate a well-defined national irrigation policy. It is upon the reports of these commissions that the present congress is acting.

These earnest men announce that they are preparing the arid public domain to receive the surplus population of the East. They boldly claim there is room for sixty million people to subsist in the western half of this country, where now but four million exist. The agency that will make this possible is the proper system of irrigation works constructed under State and national supervision in every commonwealth of the West.

The federal government within thirty days has ceded one hundred million (100,000,000) acres of surveyed arid lands to the States and Territories in which they lie. This congress is discussing methods of reclaiming these lands and how to populate and develop them. Surely these are weighty and worthy issues for any company of men to debate. The members of the irrigation congress are not shirking their duty, if they are having a good time. They are earnestly trying to solve a great question, and it speaks well for them that they grapple it so enthusiastically in the hour of darkness and strife and evil foreboding in the West. They are saying in substance, "Fellow-countrymen, lend us your ears to hear the new doctrine of agriculture. Irrigation is to farming what steam is to manufacturing. Your eastern farmers are a quarter of a century behind the time, complaining of drought and praying for rain. We are masters of the situation, for we make rain when we want it." The irrigationists point to the countries of Europe and the Orient which have played the most important part in history—Italy, Spain, Egypt, Persia, Asia Minor, India—all wholly or in part dependent on irrigation. They go on to assert that the hideous misnomer, the Great American Desert, has been changed into the triumphant term of the Empire of Arid America by the success of the Greeley colony, the Mormon settlements and the southern California communities, and by the building of cities on arid plains like Denver, Salt Lake and Los Angeles. In these vicinities population is as dense as in the most thickly populated agricultural districts of Europe. It is the aim of this congress to frame resolutions for extending the work of reclamation that shall speedily become crystallized into federal and State laws.

It was of this country, where the irrigation movement is in progress, that Daniel Webster said on the floor of the Senate, in 1838, when a post route west from the Missouri was under discussion—

"What do we want of this vast, worthless area, this region of savages and wild beasts, of deserts of shifting sands and whirlwinds of dust, of cactus and prairie dogs? To what use could we ever hope to put great deserts or those endless mountain ranges,

impregnable and covered to their base with eternal snow? What use have we for such a country?"

After the Irrigation Congress has spoken, the prophetic value of Webster's resonant periods will have undergone a distinct diminution—for once.

DENVER NEWS.—The third session of the National Irrigation Congress has met and adjourned. While the delegates were guests in the city it was proper that the *News* should refrain from any criticism that would seem harsh or discourteous. In fact, it was necessary that its final action should be taken before any just comment could be made, either on its resolutions or on the evident purpose which animated the organization. It may now be said in all fairness and candor that the results of the congress are disappointing, and that the spirit which moves its most active promoters is antagonistic to the best interests of the arid region.

It is so evident that the single object of the congress is to obtain the cession of the arid lands to the states that the fact need hardly be asserted. That resolutions to this effect were not adopted is due to the active opposition and effective work of Colonel Hinton, Prof. Stanton, Congressman Coffeen, of Wyoming, and others less prominent but not less determined in their opposition to so dangerous a scheme. But cession has not been defeated. The monopolistic spirit is tireless; corporations ever watch and wait. The cessionists will turn up at Albuquerque a year hence as fresh and determined as ever. What they cannot win by open fighting they will attempt to gain by strategy.

PHILADELPHIA LEDGER.—The irrigation issue bristles with difficult questions, which can only be settled by the highest order of practical statesmanship. Shall the national or state governments control the public lands subject to irrigation? Or shall there be more localized oversight and supervision? No control which might deprive any portion of the irrigated territory of water would be tolerated, a danger which is far less likely to occur under public ownership of the irrigated works and sources of supply. Water is not, from its nature, private property. Each land owner has the natural right to the use of it, but if it is brought to his door by artificial means he must pay for the use of it. Subject to this restriction, running water everywhere should remain free. Ninety-five per cent. of all the streams in the arid regions are located within five organized mountain communities, and this makes it imperative that the nation should permanently reserve these sources of interstate waters west of the 100th meridian. "The cession of the public lands to the several states, Colorado, Idaho, Montana, New Mexico and Wyoming, means the dominance of the few and the inauguration of the forces of separation." There is force in this reasoning. The waters of our great streams should be always subject to some such general national supervision as that given to the general government in the interstate commerce act.

IOWA CITY (IA.) CITIZEN.—There are millions of acres of unproductive land west of the 100th meridian that could be made productive if water could be procured for irrigation. The proper thing for the government to do is to make a free grant to the states and territories of the arid country within their borders and let them solve the irrigation problem.

SAN FRANCISCO BULLETIN.—The Irrigation Congress just assembled at Denver concerns chiefly the States west of the Missouri river. California will be represented as one of the arid States, or the one which has carried irrigation further than it has been carried in any other part of the country. It has done this without Federal aid and without any practical help from irrigation conventions held outside of the State. It is true that a certain amount of arid land was graded down in this State by an Act of Congress, so that large areas could be bought on speculation.

California has slowly worked out its own system of irrigation. What was first done in a small way is now done in a large way. District systems were an enlargement of the individual plan. Southern California and the greater part of the San Joaquin valley are now nominally embraced in systems of irrigation, either actually or in the future. The immense citrus development of Southern California has depended upon artificial irrigation. There is not a citrus orchard of any magnitude in that part of the State that is not regularly watered through artificial channels. Every new orchard planted will depend upon a similar water supply. Every raisin vineyard in the great San Joaquin valley is brought up to the highest bearing standard by irrigation. The planting goes on from year to year at an increased rate as to citrus fruits and at a lessened rate as to raisin grapes. All the new acres must be irrigated. To the acreage already brought under cultivation in that way will at the present rate be added another equal acreage in a few years.

Southern California, which in some years was well watered by seasonable rains, did not have moisture enough last winter to make cereal crops nor enough to make sufficient pasture to carry the stock. Every stream that can be utilized for irrigation will be made to contribute to the agricultural prosperity of that part of the State. Only a small per cent. of the arid land of California has ever been redeemed. That part on which water has been brought was not barren. It would not produce full crops every year with the amount of natural moisture falling on it. That was true of nearly all the land now watered by artificial means in the San Joaquin valley and in Southern California, save a few desert tracts that do not make much of a figure.

As this State leads all others in its development of agriculture by irrigation, and as this has been done without Federal aid, it is a question whether this independent system is not better than anything that can be made to depend upon the assistance of the government.

In California there is now a well-settled principle of riparian rights. Water not only goes with arid land, but it goes with fertile land. A riparian right is as well settled as the right to the trees or the stone quarries on the holdings of the occupants.

OMAHA BEE.—The Third National Irrigation Congress is expected to have more important results than were realized from its predecessors, which were valuable chiefly in arousing public attention to the importance of the irrigation question. The time for action had not arrived, nor were the people of the West ready to formulate an expression of their best judgment. There was also lack of interest in the subject in other sections of the country. In the period since last congress, however, public interest in irrigation has been awakened everywhere, and in

the East, almost as much as in the West, its great importance is recognized. It is expected that some plan of compromise will be reached between the factions, one of which has insisted that the national government should appropriate all the public money required in the work of reclaiming the public land and administering canal systems when built, and the other that the arid lands should be ceded to the States, in order that each commonwealth might deal with its own problems. An effort will be made to find some middle ground between these extreme views, a plan which will give most of the benefits of both policies and few of the evils of either.

The reclamation of the arid regions will be a work of mighty proportions. Its accomplishment will occupy the time of a generation or longer, and will require the expenditure of an enormous amount of money. But it means, when accomplished, an addition to the wealth of the country which will many times repay the cost. Hostility to the great scheme of adding hundreds of millions of acres to the productive area of the country, with all the grand possibilities of such a consummation, has been largely silenced, and there are few who do not concede the vast importance of this question and its claim to the earnest attention of statesmen.

CHICAGO INTER OCEAN.—It is sincerely to be hoped that the National Irrigation Convention at Denver will succeed in doing something to impress Congress convincingly of the importance of reclaiming the vast areas of arid land in the West. There is grave reason to deplore the evasive action, or rather inaction, of our government in relation to questions that so vitally concern the welfare of the nation as the care and extension of our industrial interests. Splendidly successful in converting desolate and waste regions into fertile lands as the system of irrigation has proved in sections of the West, the expense attached to this artificial process of rehabilitating nature is so great that most States and Territories are debarrd from operating on any profitably extensive scale. The fact of the matter is, that the conversion of arid lands into fruitful farms is as beneficial indirectly to the country at large as it is directly to the State so enriched.

Every acre of land added to the agricultural service of the country is a national gain, and the millions of now useless acres in the West might be reclaimed, to the part solution of our problem of how to dispose of the unemployed. The irrigation of these lands means increased opportunity, increased labor, increased production, and increased wealth to the people of the United States.

We might reclaim these arid lands and attempt to introduce there a system of land cultivation somewhat similar to that of France, where are the smallest farms and the thriftiest peasantry in the world. There the limitation of land holdings makes it necessary to cultivate every inch of ground, and the result is that there are no waste lands in France and scarcely such a thing as a poor farmer. Here is an extract from the speech of chairman Smythe at the opening of the convention, that should be carefully considered, as it sets forth just what are the possibilities in the West.

"Estimates differ concerning the precise capabilities of Western America, but the most critical economist among all our students of water and land concedes that we can sustain, under a proper system of

irrigation, as many people as now live within the boundaries of the United States. Founding our faith on this conservative authority, we send to the people of this troubled nation the message: 'We are coming, Father Abraham, with homes for 70,000,000 more—homes where irrigation shall guarantee industrial independence and the small farm unit the equality of men.'"

MINNEAPOLIS TRIBUNE.—The Third National Irrigation Congress convenes in Denver to-day. At the previous meetings of the Irrigation Congress, the principal question discussed was whether the arid lands should be ceded to the States or controlled by the national government. The First Congress recommended cession; the Second appointed a commission of two from each of the seventeen States represented to investigate and report. The report of this commission formed an interesting feature of the present congress, and the discussion upon it will help to form a national irrigation policy and code of common State laws. The irrigation problem is attracting attention outside of what is popularly known as the arid region, because the irrigation of that region will add vastly to the aggregate of the products and the wealth of the country. Minnesota has no arid lands, strictly speaking, although in some sections of the State irrigation from artesian wells or streams could unquestionably be used with advantage as protection against periods of drouth. But North and South Dakota and Montana, States with which our merchants have intimate business relations, are deeply interested in the irrigation problem.

ST. PAUL DISPATCH.—The progress of irrigation in arid regions is such that millions of acres are under cultivation, and the Irrigation Congress to be held at Denver will undoubtedly do much to determine the future development of this immense region. Many persons are urging that the government should engage in irrigation enterprises, but it is believed that this work can be better carried on by the States and Territories, under wise restrictions.

THE CROOKSTON (MINN.) TIMES.—All of the northwest States should be interested in the National Irrigation Congress, which convenes in Denver shortly. Kansas and a few other States that have suffered from the drouth this year are of course more directly interested. The solution of the irrigation problem will result in small farms and diversified crops.

PHILADELPHIA INQUIRER.—Should the Congressmen from the East and South vote in favor of extending national aid to the West, when there are so many millions of acres of land along the Atlantic coast open to settlement, and to be had for such low prices? The irrigation of western lands, now unproductive, by the government will mean more competition for eastern farmers. The hope of the eastern farmer has been that the home market would catch up with the country's products, and that the supply of western land to be had for little or nothing would become exhausted. This hope will be deferred if vast areas of land are made productive by national irrigation.

DENVER REPUBLICAN.—The future welfare of the United States depends in no slight degree upon the answer to be given to the question of what

shall be done with the arid lands. At least one-third of the area of this country is arid, and the ability of the nation to support a large population depends very much upon the extent to which this arid area can be reclaimed and made fertile. In this we see the vast importance of the problem.

There is a division of sentiment among men who have considered this subject as to the proper policy to be adopted. Some persons take the position that Congress ought to appropriate money for the construction of irrigating ditches and storage reservoirs. They claim that since a great deal of money is expended upon the improvement of rivers and harbors in which the arid region has but a remote interest, it would be nothing more than just to make a similar expenditure in the construction of works for the reclamation of arid lands.

On the other hand, it is claimed that the better policy is to have Congress grant the arid lands to the several States and Territories in which they may be situated upon the condition that those States and Territories assume the burden of reclamation. If this were done, each State receiving such a grant would assume the duty of constructing the irrigation works requisite, and the control of all matters pertaining to irrigation in its limits would be in its hands.

As between these two policies, the latter is to be preferred. It would be practically impossible to induce Congress, in the face of Eastern opposition, to make sufficiently large appropriations for the construction of irrigation works. Eastern farmers would say that their money ought not to be taken for the reclamation of land which would be used in competition against themselves. The East controls Congress, and in the face of this opposition very small appropriations, if any at all, would be obtained.

Furthermore, a national law would not be so free from defects as a State law, for very few of the members of Congress know anything at all about irrigation. The irrigation problem is a very intricate one, and it presents many difficulties even to men living in the arid region. It may be taken for granted that Congress would not handle it as well as the legislature of an arid State.

CHICAGO TIMES.—As to the necessity and value of some general scheme of reclamation of those arid lands of the West there can be no dispute. Millions of acres of fertile but now barren soil in over a dozen States and Territories but await the touch of water to blossom into productive farms and gardens, capable of supporting an immense population. And artificial irrigation is no experiment. It has been proved successful beyond man's fondest hopes in the many districts where private or State enterprise has already introduced it. But the work of reclaiming the great arid tracts which are within reach of the surface of the subterranean waters of the Platte and Arkansas rivers and the dozens of minor streams which find their way from the mountains down into the dry plains of Colorado, New Mexico and the western portion of Kansas and Nebraska, is an immense one—a veritable task for Titans. Still, these lands should be reclaimed, and the privilege of reclaiming them should not be left to private corporations, either. The general government should do the work, or else it should parcel out the lands to the various States; not to be turned over to irrigation companies, however, but to be irrigated by the State itself. And none of these

lands which now belong to the public domain, or which shall hereafter be recovered from the railway monopolies which unlawfully and immorally hold them, should ever be sold or given away. Let the federal or State governments build the reservoirs and dig the canals and ditches which are to turn these desert tracts into productive farms, and let them leave the lands in such lots as applicants may require, charging a fair annual rental per acre based upon the value of the land. Thus will the bonds or other obligations issued to pay the expenses of constructing the reservoirs, canals and ditches, be speedily redeemed and a perpetual income assured the State from the only proper and natural source for State revenues, the land itself.

SALT LAKE CITY TRIBUNE.—The more the subject of irrigation can be agitated, the more life will come to it, and the importance of it cannot begin to be estimated. As for the land in the arid belt, there is this to be said about it: The people in the east read of the number of acres and seem at once to take up the idea that it is a part of their inheritance, and seem further to hold to the idea that these lands are something like the lands in the Mississippi valley, most valuable now and prospectively. The Irrigation Congress ought to emphasize the fact that these lands are utterly worthless until they are redeemed, until water is carried upon them, and that the expense is something so great and the region so vast that the federal government cannot be relied upon to do the work, and that in the interests of all the people, east and west, the government ought to cede these lands to the respective States. Then each State could have the handling of the question itself, and could decide whether to try and do it as a state measure or whether to give contracts to corporations to do the work, putting such checks upon them as to secure the water needed to cultivate the land at fair charges.

INDIANAPOLIS JOURNAL.—The Irrigation Congress now in session at Denver represents a movement of general interest. The benefits and possibilities of artificial irrigation as a means of reclaiming arid lands or insuring regular and abundant crops have been known and practiced in some parts of the old world for a long time, but not until recently has the subject received much attention in this country. As long as we had vast areas of fertile land still unpeopled, which were fairly watered by nature, it was hardly to be expected that much thought should be given to artificial irrigation. Gradually, however, the subject has been forced upon public attention. Experience has shown that the arid and desert lands of the west, which, in their natural and dry state, do not bear even a blade of grass, become wonderfully fertile and productive under irrigation. There are millions of acres of such lands in some of the Western States that can be reclaimed from a desert condition and made to yield abundant crops by a general system of irrigation. To establish such a system would, however, be so costly that it is beyond the reach of private enterprise, and it is to solicit government aid that the Denver convention is called. The work seems to be a suitable one to enlist government aid, but it would seem that such aid should come from the respective State governments rather than from the national government. In a certain sense it is to the interest of the entire country that every part of it should be brought under cultivation and made pro-

ductive; but it would hardly seem fair to tax the people of the Eastern or Middle States to reclaim the arid lands of Kansas, Colorado, Idaho and other States, the benefit of the redemption of which would inure almost exclusively to the States in which the lands lie.

In this connection it may be of interest to state that many farmers in Iowa, Illinois, and some even in Indiana, have adopted methods of artificial irrigation as a means of securing regular and abundant crops in dry seasons. In every case where the experiment has been tried it has been found very useful, both as a protection against drought and as an aid to nature.

CALDWELL (IDAHO) TRIBUNE.—Idaho is directly interested in the Third National Irrigation Congress. The congress should be a unit regarding the most feasible plan of the irrigation of the arid region. It should settle the question of the division of the waters of interstate streams; it should unite upon everything that would promote the best interests of the West. It should attempt to unite the different organizations incorporated to advance the colonization of the arid regions. If colonization organizations should unite in advertising the immense resources of the West, it would be the means of assisting many deserving families to independent homes. We have made a mistake in thinking that all that was needed was wealthy settlers. What we want are families with capital sufficient to place in cultivation the arid and arable land. The speculator allows his land to lie idle, and allows his neighbors, who are earnestly striving to make a home and an independent living by their work and energy, to appreciate the value of his, the speculator's, lands. These speculators are not only useless incumbrances on the land, but also retard the settlement of the country. Now, if these lands were settled by a class of sturdy and industrious farmers, they would soon create a market for fruit, cereals and live stock. The progressive business men and citizens should see to it that a law be passed by the next legislature making it obligatory upon the holders of public lands to improve them. Make them cultivate so much of their land every year. Let all assist in the growth and progress of our country, and let the land and water question be justly and equitably settled by legislation. These questions are of vital importance.

COLORADO SUN.—The importance and necessity of irrigation are established in the minds of the people. Ways and means, methods and laws, are now to be considered. Business, trades and politics will be interested in the question ceding the arid lands to the several States. Out of all the differing opinions, it is expected that a harmonious agreement will be reached, and that the outcome will be the framing of a bill, which can be presented to Congress with a solid, unanimous endorsement of the irrigation interests.

LOS ANGELES TIMES.—The question of irrigating the arid lands which belong to the government must not be lost sight of. In view of the unrest and dissat-

isfaction which are abroad in the land, it is more than ever necessary that something should be done to provide homes for industrious Americans. Such homes may be created by thousands in the regions that are now known as desert. This is the last chance of the poor man to obtain a home from the government, and it would be a national disgrace if the government should fritter away this birthright of the people by granting the lands in question to the various States, through whom they would soon be transferred to syndicates.

It would not take long to settle this question if the people of the East understood it half so well as we do in the West. But, unfortunately, such is not the case. Ignorant of the great things that have been accomplished in this section by the conducting of water on land that is otherwise worthless, most of the Eastern people look upon any proposition to irrigate what they have been accustomed to consider as "deserts" in the light of a wild and impracticable scheme. It is for this reason particularly that every effort should be made to enlighten the people of the East on this subject and to interest them in it. One of the best methods to accomplish this purpose is by the holding of these periodical national congresses.

PEORIA (ILL.) JOURNAL.—The Irrigation Congress decided to ask the National Congress for sufficient appropriations to push irrigation surveys—the ascertainment of water supplies under ground, surface and storm. The address of the congress is clearly and eloquently written. It declares that irrigation solves the problem of homes, and asks the country to consider the issues presented.

KANSAS CITY STAR.—It is a matter of regret that the National Irrigation Congress at Denver should have been opened by what sounds like a note of lamentation and depreciation of the United States of America. The particular cause of complaint at Denver was that in this formerly supposed to be free country only five per cent. of the people owned their homes. A more cheerful statistician would be apt to find that a much larger proportion of American citizens owned the land on which they lived. But, supposing the estimate to be correct, a regard for truth and justice should dictate the statement that, if the ownership of land is not widely diffused, it is not the fault of the laws or institutions or practices of the government of the United States. After reviewing the history of the public lands since the time of the Louisiana purchase, it continues: At a late period the Homestead law was passed and the policy called by its advocates, "Homes for the homeless and lands for the landless," became that of the government. The Homestead law, it should be remembered, is made applicable to all public lands, whether in the new States or elsewhere.

There is certainly plenty of land, and there is abundant room for its development. There is not a county which is cultivated to its utmost agricultural capacity. It would be desirable, doubtless, to add to the productive lands by irrigation or any feasible means.

THE ART OF IRRIGATION.

SEVENTH PAPER: CHOICE OF METHODS.—SMALL STREAMS.

BY T. S. VAN DYKE.

YOUR choice of methods in irrigation is not only limited by the quantity and heads of water at your disposal, as explained in the last chapter, but by the texture of your soil, its slope, drainage and several minor points.

All these things you should determine before laying out your ground for any system, for whatever system you adopt you will not be likely to change. As important as any of these is the texture of the soil. If it is very open you will have to use a different system from the one you could probably use if it were of closer texture.

FORMATION OF SOIL.

All soil is formed from disintegrated rock, sometimes disintegrated in place from the bed rock beneath, in other places washed in from a distance. Where this wash has been by the flow of some stream it forms what is called bottom land. Where it has been carried only by occasional heavy rains, aided by the drift of winds, it is called slope or plain. This is a truism, but you want to keep in mind the distinction.

Part of this disintegration of the rock is chemical and part mechanical, resulting from the incomplete work of the chemical operation. By the chemical part the rock decays into a fine powder or paste, according to the amount of water present. This in all its forms is called clay, and the name is sufficiently accurate for our purpose. The part that has not yet decayed is in hard pieces, and called sand or gravel according to its size. Sedimentary clay is where this fine part has been washed out and deposited in beds. It rarely makes good soil to work.

THE BEST SOIL.

The best all-around soil, and the best to irrigate as well as cultivate, is that which contains clay, sand and gravel in about equal proportions. If it has too much clay it will be tough and hard for the water to penetrate, and when it does once penetrate it may stay too long and in too great quantity and keep the soil cold. When it dries it is quite apt to harden quickly at a certain point, leaving you little time to work it fine; and when it does harden it is quite difficult to make fine without wetting again. Though this soil may be very rich, like some of the adobes, it may be very troublesome to work with water. It has, however, one advantage. It can under all circumstances be irrigated with small streams, and it is never necessary to flood it unless it should be very

much cracked from excessive dryness, which is quite apt to be the case if clay is much in excess.

Where soil contains an excess of gravel it will not crack when dry. Nor will it hold any excess of water or bake so that it cannot be easily broken up. It is also warm and often far more fertile than it appears. While it will rarely produce good grain or heavy corn, it is generally the best fruit land, owing to its warmth and perfect drainage. But it will let water through like a sieve, and is called by some "leachy." It is so named because the water is supposed to leach out and carry away the fertilizers it contains. From the irrigator's point of view it is objectionable because it will not hold up streams of moderate size, but must be flooded. And as a rule it takes water in large heads and quickly handled to flood it properly.

Soil containing an excess of sand is a medium between these two, and is generally so open that it must be flooded. It may not require such large heads or need them so quickly handled as the gravelly soil, but it is too open to hold up small, slow streams. Some of it may be irrigated by side soaking from large streams, but often it is too open for that and water drops through it too directly downward and too fast. It is also deficient often in capillary attraction of the kind you want, and will not bring up moisture from any distance below, while it will let it off from the few inches at the top so fast that shallow rooted stuff will need irrigating every few days in spite of all the cultivating you can do. Some of this soil you cannot keep moist by any amount of cultivation. Other ground, that to the eye may be of the same texture, may contain so much more clay that it will retain moisture perfectly with cultivation.

BOTTOM LAND.

Much river bottom land is so open that it must be flooded, and where it is a wash of particles quite uniform in size it is not likely to retain moisture well. Nor as a rule will water soak sideways in it at any distance from furrows. You must, therefore, prepare to flood such land, and for shallow-rooted vegetation must be prepared to flood it often. If you cannot get water in large heads, and at nearly the right times, put deep-rooted stuff in the ground.

UPLAND.

As a rule upland, or drift by rains and wind from the hills, contains enough clay to hold up very small streams to allow the water to soak some distance on

each side the furrow and upward as well as downward, to allow the wetting to be quite uniform and not dry too quickly at the top, while it also has enough gravel to keep it from stiffening too quickly when it reaches a certain point of dryness. It generally retains moisture well with cultivation, and has enough capillary attraction to bring up moisture from below to roots near the surface as fast as the surface moisture dries away.

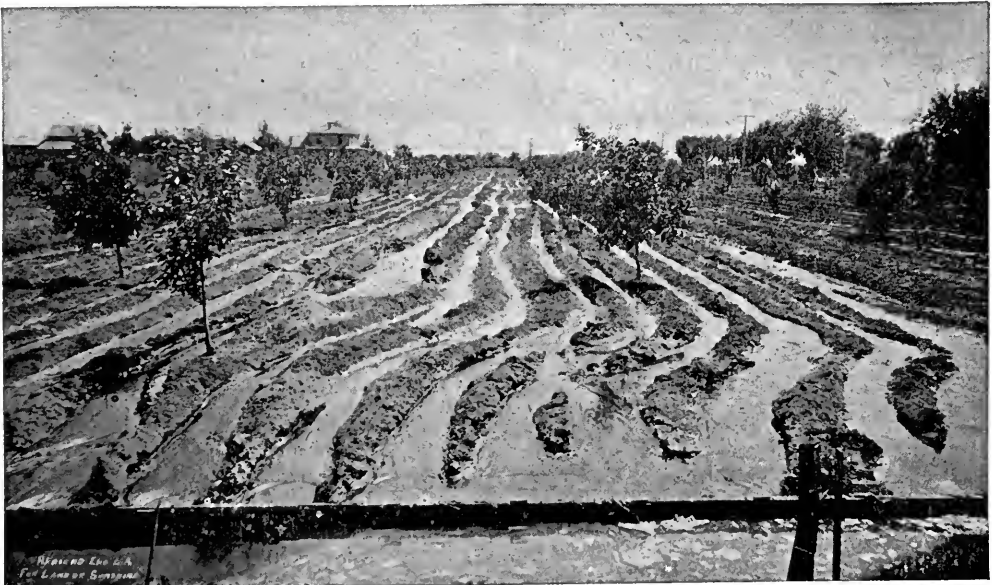
WILL THE SOIL SUSTAIN A SMALL STREAM?

The most important thing therefore to determine at the outset is, whether your soil will hold up a small stream or not. If it will it is quite apt to have the other qualities of upland. If it can be irrigated from

deep, made in ground plowed and harrowed as ready for planting. Get a hoe and watch it, and don't allow any ass of a neighbor to come around and tell you that that little stream is never going to get anywhere. And don't lose your patience if you find that it is miserably slow, while the aforesaid neighbor tells you that folks that write books don't know anything practical.

TIME IT.

Measure off so many yards of the furrow and time the stream. If it runs a yard a minute without any special coaxing it is doing finely and your soil may be irrigated in any way. If it will run ninety feet in half an hour without any more coaxing than taking



A SPECIMEN OF VERY BAD FURROW IRRIGATION.

Amount of Water about Five Times too great: Uneven Feed of Water into the Different Furrows: Such Work Washes Off the Fertilizers, Leaches the Natural Fertility out of it and is in Every Way Bad, because Wholly Unnecessary.

small furrows it may be worth twice as much as if you have to flood it, while it is quite certain to be worth twenty per cent. more in the saving of labor alone. Land of this sort you can always flood if you wish, or irrigate in any other way. But land that has to be flooded is generally limited to that method alone.

To test this point, turn out a stream of one gallon a minute, which is about one-ninth of a miner's inch under four-inch pressure. It takes little trouble to be tolerably accurate, so measure it with your watch. A kerosene can, which it should take about five minutes to fill, is handy on almost every place. Turn this stream into a furrow about three inches

an occasional clod out of the way or breaking down the barrier of some little basin it has made, it is all right. You can coax it at double or triple this speed by smoothing its course with the hoe just in front of it. But as you cannot do this in practical work on any extensive scale, you must test it, as it will run without special coaxing.

In a field of any considerable size you cannot coax it very much. About all you can do is to go over the field with the hoe and see that one furrow has not broken into another, or that a gopher hole is not taking all of one or more furrows. In passing you may throw out a clod of earth here and break a little dam there, but that is about all you can do. You must

overcome these things generally by forcing a larger head through at the start. Once through, cut it down to just enough to insure continuing through. But don't turn on enough to cut or puddle the furrow to any extent.

TRY A LARGER STREAM.

Turn on, therefore, two gallons a minute and time that. If it don't get around clods, leaves and little ridges of dirt at the rate of a yard a minute, increase it until it does. If a stream of two or three gallons a minute does not travel at this speed the furrows are badly made and it will pay you to take more care with them. Remember, if you can make this system work it will save you time and money, shoe leather and patience incalculable, besides doing far more effective work on nine-tenths of the stuff you will grow. It will also do it with less water and less waste of fertilizers by leaching than flooding. If there is any danger of malaria from irrigation there will be none from this, and in all respects it comes nearer in its results to rain than any other way of applying water that is practicable on a large scale. It was first reduced to its present fine proportions at Riverside, California, and has since spread over all parts of Southern California, where the soil will permit its use and where large enough heads of water can be had for a sufficiently long time. It is not an invention of any one, but is simply an evolution from the common furrow system. In exact proportion to the perfection it has reached has the character of the fruit advanced, until there is no finer in the world of any kind than that produced by the right amount of water applied in this way and the right amount of cultivator afterward.

TEST THE SOIL.

In whatever way you wish to irrigate it is important to test the tightness of the soil at the outset. If you have not water enough to use the small furrow method and have to use basins, then it is very important to be able to run the water from basin to basin without losing much of it on the way. When you use basins at all it is because there is no water to lose. To run the water from basin to basin is much less trouble than using hose or water-carts, or any other annoying ways of delivery. You can also vary the shape of your basins more and do better work, even of the basin kind. If you have your water in large heads with a short run, as is sometimes the case, and you are driven to flooding, then, if the soil is tight enough to hold up these small streams, you can flood with less work than where the soil is very loose. There is less danger of the checks breaking or cutting under a slight leak, and as the water will stand longer in them it will not take the same care to rush it over the field so as to insure a uniform depth of water in all the checks.

In making this test, do not be alarmed if the small stream vanishes in a gopher hole every time your back is turned. Where ground had never before been irrigated it is apt to be a perfect sieve from gophers, moles, mice and other burrowing animals. Stop any such hole by pressing dirt into it and let the water go ahead.

If the stream starts off at the rate of a yard a minute for one-ninth of an inch, or a gallon a minute, your soil is all right. But you cannot expect it to hold this speed very long. If the soil is porous enough to be valuable, the stream is losing some all the time and cannot run so fast. The streams in common use where this method is brought to its highest perfection cannot be easily measured because they vary so much. But they range from one-fourth to one-tenth of an inch each, with an average probably of one-sixth. This is guess-work largely, but I have watched them hundreds of times, have divided the head by the number of streams, the head being known because paid for at the office, and have asked the opinion of scores of irrigators who were in the habit of dividing up the heads, and one-sixth of an inch is about the average for the finest work. It is, however, common to start with larger streams to rush the water through and then cut them down. Sometimes this cutting reduces them as low as one-tenth of an inch each. But about one-sixth, or a little less, will generally do.

HAVE FAITH IN IT.

It takes these streams as ordinarily used from twelve to twenty-four hours to cross a square ten-acre tract. As it is six hundred and sixty feet across a square ten acres, this is a speed of from about six inches to a foot a minute. And this is about what they will make, varying some with the slope of the ground, the care with which the furrows are made, the number of clods that fall into them, etc. The main thing is to let them alone. Go to bed or down town and don't worry about them. At first the holes in the ground will make you plenty of trouble, and unless you have plenty of faith you may despair of making this system work. But after a few irrigations, gophers and all other things that make holes will disappear and no more will come. The holes will fill up and the water will run evenly in every furrow that is properly made.

If the water runs at the rate of a yard a minute at the start, the soil is right for any method of applying water. But if does not run at that speed it by no means follows that you cannot use small streams. The top soil may be more porous in one part of the tract than in another. It will be very hard to find a tract of any size with the soil all of uniform texture. I have seen it on prairie in wet countries, but there is very little of it in the dry coun-

tries. It often varies with a few feet, so that the stream may be slower in some places and faster in others. There may also be a hard pan, or perhaps no hard pan but only a finer soil below, and the little stream will have to wet down to that before it can get ahead much. Sometimes it will drop at once out of sight, and you think it impossible for it even to move ahead. But if you leave it for a hour or two you may find it several feet or yards ahead of where it was. But do not in any case be in haste to decide that the small stream will not work. Either increase its size and rush it through, and then cut it down to what you want; or if it is moving evenly but too slowly, give it plenty of time. Where you can get heads of water for three or four days if you want them, a few hours' difference in one of these streams crossing a tract is of little consequence. They are rarely run over six hundred and sixty feet, and it matters little whether it takes twelve, twenty-four or

thirty-six hours to get across, unless you are limited too much in the time you can have the irrigating head.

One would suppose that in this way the upper part of the tract would be too wet and the lower not wet enough. Theoretically this is true, and the most water must be in the upper side; but, practically, no difference is seen between the two sides of the field, or if there is any it is too slight to notice. The run of water is made long enough to insure wetting the lower side enough. The fault, if any, is in wetting the upper side too much. But if the land has the drainage underneath that it should have for most valuable products, this will do no harm, while, if it has much slope, the water will find its way in time toward the lower part.

The depth of wetting, the things for which this system may be used, and other points will be considered farther on.

THE FIELD FOR HOPS IN IDAHO.

BY J. M. GOODWIN.

HOP RAISING in Southwestern Idaho is a new industry for the people. Only three or four years ago some hop roots were planted around the cabin on the ranch belonging to Mr. P. P. Shelby, near Parma, for the purpose of adding some comfort and attraction in having the vines trailing over the house. When these vines began bearing the hops were so large and perfect, and so prolific, as to create much wonder and interest. Mr. Shelby, being an officer of the Great Northern Railway and located at Seattle, had opportunities of looking into the hop business in that great center of hop culture, the Yakima country. This resulted in his planting ten acres to hops three years ago, from which, in 1893, the second year's growth and first to bear, he harvested seven and one-half tons of hops, or an average of 1,500 pounds of hops per acre. He expects this season to double that product on this ten acres, while on the fifteen acres more now bearing the first crop he hopes to harvest 1,500 pounds to the acre. It is said that in the hop districts of New York the average yield is 700 pounds of dry hops to the acre. Mr. Shelby's ranch is under the Caldwell canal. The land is rich and is classed as "bench" land, similar to many hundreds of thousands of acres of the Snake River valley. Two years ago certain hop raisers of the Yakima country visited Idaho in search of new lands to till. They located under the Payette canal company's ditches, about eight miles a little east of

south from Payette. A recent visit by the writer was full of interest. The owners are the Golding Hop Company, who are putting 160 acres under hop culture, while they own in all 1,000 acres. Three years ago this land was covered with sagebrush, was the home of jack-rabbits, lizards and toads, and a desolate desert to travel over. Now, life-giving streams of water course here and there, carrying nourishment to the rows of hops, corn and various other crops, which flourish equal to such in the most favored localities. This farm, not three years old, is a veritable oasis in a desert, and the whole country around promises to be soon transformed into fields of grain, hops, fruit orchards, meadows, and beautiful homes of prosperous people. The company has thirty-three acres of hops now loaded and ready to yield its first crop, this being the second season since the roots were set. Last spring ten acres more were set in hops, and each year similar or greater additions will be made. Of the thirty-three acres now bearing, two styles of support for the vines are used, one-half being by means of poles, the other by means of "trellis." The poles are simply small pine trees cut in lengths about fourteen feet and set in the ground. The vines winding around these are supported as long as the pole stands, but should it blow over there is danger of destruction of the hops, and then it requires much labor to take these poles down and clear them of vines after picking season is over. The trellis sys-

tem, while new, is popular for several reasons. In planting, the hills are in rows both ways and seven feet apart, with two plants to the hill. This makes 881 hills to the acre, or double that number of roots, which cost about \$3.00 per 1,000. In putting up "trellis" a line of posts extending thirteen feet above ground is set the whole length of a row, the posts being fifty-six feet apart, or a distance of eight hills. Each row has a line of posts. Over the top of these posts are stretched a number eight galvanized wire. Heavy cotton twine is thrown over this wire so as to rest half way between each pair of hills, while the twine is staked down at the hills. Up about halfway the twines are tied together immediately over the hills, thus clearing the way for horse and man to pass through in cultivating with plows, etc. The roots throw out many vines or shoots, all of which are cut off, except two from each root. These are trained up the twine, the four vines of each hill curling into a rope up to where the twines separate, and they are then trailed along these to the right and left until the wire is reached, to which the vines cling and hang in festoons. After the ground is well worked by cultivators, two furrows are run with a shovel-plow to make ditches for the water to run. This trellis system is anchored not only at the ends of each row but also crossways, by means of wire firmly staked all around and extending over the top of each post. Thus secured the vines cannot be seriously injured by winds. The posts used for trellis are 4x4 scantling. At this writing the vines are literally loaded with hops, the bolls being from one to three and one-half inches long. They expect an average yield of



HOPS ON WIRES.

over 1,500 pounds per acre, and that next season this will be doubled. The varieties are the English Kent Golding, the American from Yakima country, and the Bavarian, their quality rating in the lines named above. No one can look at this beautiful field of hops without being charmed with it, and being possessed with the idea that this is to become one of the important industries of these arid regions.



HOPS ON POLES.

While the tall straight poles stand firmly in the ground and are covered with hops reaching out branches from the main vines in every direction, there is a look of insecurity, making one expectant of the poles being leveled to the ground with their heavy burden by the strong winds which pass over the country. With the trellis there seems ample support in the strong cord or twine and wire, and the wind simply produces gentle swayings of the vines.

Mr. J. Carmichael, the superintendent, has had much experience in hop-raising in the Kent district, England, and in the Yakima country, Washington. He does not hesitate in saying that his present location is the best for hops of any country he knows of. The soil is excellently adapted to the culture, while the arid and hot atmosphere of this valley, with plenty of water to irrigate, produces the very best results, not only in quantity but in quality, while a very important feature is the fact that no insects trouble the plants, and there will be no red rust, which in moist climates is so common and will entirely destroy a crop in a few hours.

The dry and storage house is not a very expensive affair. It is a frame structure about 30 x 60 feet in all. The drying rooms, or "kilns," consist of three rooms in each, at which are located stoves, fed from outside, and supplied with large flues or pipes to carry heated gases and produce the required temperature in the room. This is regulated by means of openings around the bottom of the room. This heat passes upward through hops spread on the floor of the second story, thence along with moisture out through a dome extending above the roof. The upper floor is made of slats, leaving half the space open, except that canvas is spread over it for the hops to rest on. After drying, the hops are dropped into a room off to the rear side of the dryers and then put into bales. During drying, sulphur is burned in the room below to the extent of bleaching the hops as desired.

Picking and drying began in early September. The regulation price of one cent per pound of green hops was paid for picking. Women and children make the best pickers, earning the best wages. Since the shrinkage in drying requires four pounds green to make one pound dried hops, this item of picking alone costs four cents per pound, while all other expense connected with hop raising is about five cents. The cost of production, including marketing, is estimated at nine cents per pound. These estimates are on cost of production in Washington and California, where the average yield is about three-fourths of a ton per acre. Wherever this is increased to one ton or a ton and a half, as is promised in the Payette country, the cost per pound is very materially lessened. The Golding company, with its thirty-three bearing hops and ten acres more planted last spring and which will bear the first crop next season, has employed two men this season to cultivate the vines, that is, to plough the ground and keep clean; ten men for two months to string and prune the vines. This makes for the year an equal of forty-four months' labor at \$30 per month and board. Besides this there is the superintendent and probably one other man in constant employ, while the picking is all contract work and lasts only three or four weeks each season. The picking season requires 120 to 150 persons, men, women and children. Pickers congregate and camp near the hop fields, and besides earning good wages during the few weeks and at the pleasantest season of the year, enjoy the novelties of out-door work, camp life and real picnicking such as will enable hop raisers in this district to get all the help they require. When this locality is well dotted with hop farms, if there are not enough pickers to be secured in the near country, producers can draw from the cities, but there will always be plenty labor obtainable of this class. The rich soil and dry, warm atmosphere, with plenty of water and fine system of irrigation already supplied, will make hop culture here one of the greatest industries in southwestern Idaho.

A VIEW OF THE CAREY LAW.

THE RESPONSIBLE TASK CONFRONTING WYOMING LEGISLATORS.

BY J. A. BRECKONS.

"**W**HOEVER can make two ears of corn or two blades of grass to grow on a spot of ground where only one grew before deserves better of mankind and does more essential service to his country than all the whole race of politicians put together."

Accepting this ancient proverb as a truth, the next legislature of Wyoming, which convenes in January, has an opportunity to win undying fame or unending infamy, for its action in dealing with the gift, under the Carey Land Bill, of a million acres of government

land to the State will either regenerate and make a new State of Wyoming agriculturally or will relegate it back to be used as a pasture ground for herds of cattle and bands of sheep. More than this, Wyoming being the home of the author of the bill, and the statement having been frequently made that Wyoming is peculiarly situated to take advantage of the bill, naturally turns the attention of other States included in its provisions to this State, and our success or failure in dealing with the measure will be the criterion for action in other parts of the West. So that in a degree the advancement in agricultural development of the entire West, which may be made under this law, hinges indirectly upon the action of the Wyoming legislature.

NEED OF UPBUILDING.

Certain it is that Wyoming is sorely in need of some process of upbuilding. Untasteful though it may be to admit it, the State, although the youngest in the Union, has been deteriorating. In 1888, the total assessed State valuation was \$33,338,541.00; for the present year it is \$29,198,041.20, a decrease of \$4,140,499.80. In 1891, the first year of statehood, the total valuation was \$32,536,400.00, showing a decrease in total assessable valuation during statehood of \$3,338,359.80. Of this depreciation, \$1,275,967.00 has been in cattle valuations, the remaining \$2,062,392.00 being in other industries.

During this period the cattle business, which until 1888 was Wyoming's most profitable industry, has by reason of adverse winters, insufficient grass and hay supplies, falling prices and other causes, steadily retrogressed. Other industries supported by the cattle business have been depressed correspondingly, and mining and agriculture have been at a standstill; this, too, in a State that has more varied and valuable natural resources than a majority of States in the Union. Wyoming has coal in great quantities, soda, oil, the precious metals, timber, large tracts of good land susceptible of agricultural development, and a better water supply than any of the other arid States. But her mines are undeveloped, her timber supplies untouched, and with an acreage of good land equal in size to an Eastern State most of her food products are brought from Colorado and Nebraska. With natural resources so bountiful and actual results so meager the inquiry naturally arises why such a state of affairs exists. It is caused mainly by the inadaptability of the land laws of the United States to the conditions which are found in the State. The large areas of lands, owing to physical characteristics of the country, cannot be reclaimed and cultivated unless large amounts of capital are employed in the work of reclamation. Capital cannot be obtained without security and the land laws of the United States do not admit of any means of making the

lands to be reclaimed a basis for such security. Without the cultivation of these areas food supplies must be brought from other States, making living so expensive that labor cannot be secured to develop mineral and other resources.

AN OPPORTUNITY AT HAND.

The Carey Law affords an opportunity to conquer this hitherto insurmountable difficulty, and if wisely legislated upon in the State these immense tracts of land may be reclaimed, the capital employed in reclamation may be protected and recompense for its use insured, and the land may ultimately become the property of the small farmer and ranchman. Fortunately for the State the question of politics except where aroused by demagogues does not enter into the matter. The bill was framed by a Republican, approved by the Democratic Secretary of the Interior, approved unanimously by the committee on public lands and passed almost unanimously by both branches of Congress.

The committee on public lands in its report said of the measure: "The plan contemplated by the bill will prevent the land falling into a few hands, and if the States avail themselves of its provisions it will cause as wise a distribution of the lands as could take place under the homestead law."

"The land laws in existence are not well adapted to the arid region, but until some other mode is adopted and found practicable it will not be wise to repeal these laws."

"If the States complied with the conditions of the act, the lands would be reclaimed, settled upon, and disposed of to actual settlers in small tracts, thereby accomplishing the same purpose as is contemplated by the homestead laws of the United States."

In his report the Secretary of the Interior, S. W. Lamoreaux, Commissioner of the General Land Office, says: "The bill is clear and is guarded in its terms. It is the interests of small settlers. The United States holds the title until the lands reserved are actually reclaimed and settled. The building of irrigation works has been found to be very expensive, costing from \$5.00 to \$30.00 an acre under the most favorable circumstances, and only where it has been possible to secure large bodies of land has the cost been the minimum. Consequently, the most successful settlements, notably in California and Colorado under irrigation canals, have been where the lands could be procured in bodies."

"The reclamation of the arid lands cannot be accomplished to any great extent through the efforts of any single individual. Homeseekers are not men of means. Combined efforts of many settlers to reclaim large bodies of land cannot be secured nor successful results accomplished except under such municipal superintendency as shall insure economic and

safe expenditure under intelligent control and yielding thereby the greatest measure of success."

"The States are highly interested in the reclamation of arid lands within their boundaries and the settlement and cultivation thereof by individual citizens. The work is too vast to be undertaken by the General Government. The principal proposition involved, reclamation and settlement by individuals in small holdings, meets my strong approval, and this bill seems to me to present full opportunity for the practical experiment and under proper safeguards. The United States retains title until reclamation is accomplished and the land occupied by actual settlers. This, if successful, is the great object to be attained; and if unsuccessful, the United States still holds the unincumbered fee."

PLANS OF PROCEDURE.

The essential portions of the Carey Land Act are as follows: "Before the application of any State is allowed or any contract or agreement is executed or any segregation of any of the land from the public domain is ordered by the Secretary of the Interior, the State shall file a map of the said land proposed to be irrigated, which shall exhibit a plan showing the mode of the contemplated irrigation, and which plan shall be sufficient to thoroughly irrigate and reclaim said land and prepare it to raise ordinary agricultural crops, and shall also show the source of the water to be used for irrigation and reclamation, and the Secretary of the Interior may make necessary regulations for the reservation of the lands applied for by the States to date from the date of the filing of the map and plan of irrigation, but such reservation shall be of no force whatever if such map and plan of irrigation shall not be approved. That any State contracting under this section is hereby authorized to make all necessary contracts to cause the said lands to be reclaimed, and to induce their settlement and cultivation in accordance with and subject to the provisions of this section; but the State shall not be authorized to lease any of said lands or to use or to dispose of the same in any way whatever, except to secure their reclamation, cultivation and settlement.

"As fast as any State may furnish satisfactory proof, according to such rules and regulations as may be prescribed by the Secretary of the Interior, that any of said lands are irrigated, reclaimed and occupied by actual settlers, patents shall be issued to the State, or its assigns, for said lands so reclaimed and settled: Provided, That said State shall not sell or dispose of more than one hundred and sixty acres of said lands to any one person, and any surplus of money derived by any State from the sale of the said lands in excess of the cost of their reclamation, shall be applied to the reclamation of other desert lands in such State."

To carry these provisions into effect in Wyoming the following State legislation might be adopted; First. The creation of a State department of public lands, consisting of civil and hydraulic engineers and practical irrigators, similar to the State Board of Control, which now has charge of the waters of the State, with authority to inspect, approve or disapprove of proposed irrigation works, and authority to supervise them while under construction. Second, to authorize this land department to make contracts with construction companies or colonies for the reclamation and settlement within a named period of defined areas of land in the State for a specified sum, the State Board fixing the price per acre for which land and water must be sold to settlers. When the sum specified by the contract is realized by the investors in the irrigation enterprise by the sale of land to settlers, the lands remaining in the tract, if any, to be sold to settlers, the proceeds going to the State.

In all contracts the ownership of water to be inseparable from ownership of land.

Under such legislation, with thorough State supervision of irrigation works, substantial and permanent enterprises can be secured. Naming a specified sum to be paid for the reclamation of defined areas of land and to be realized at specified rates per acre from settlers, and the enforcement of the provision making ownership of land and water inseparable, makes the corporations entering the field, construction companies merely; their profits increasing with speedy completion of the irrigation works, and the speedy colonization of the tracts reclaimed with a good class of citizens. Careful preliminary engineering and knowledge of the price per acre which the State will charge settlers will show definitely to the proposed investor the profit to be realized from his investment, and capital under these conditions can readily be enlisted.

Or, the Act might authorize the State department to contract with construction companies for the reclamation of specified areas of land, segregated under the Carey Act, fixing a maximum and minimum price which may be charged settlers for the land and water and retaining a nominal price per acre to be devoted to maintaining the department having in charge the control and supervision of the lands.

These plans would allow construction companies to contract with colonists for the purchase of lands when irrigated; would allow them to employ prospective settlers upon the work of construction of dams and canals, their labor to be paid, if they should so elect, in land, or part land and part cash.

The accompanying map shows bodies of lands along the four great rivers of the State which can at once be irrigated, reclaimed, and put under cultiva-

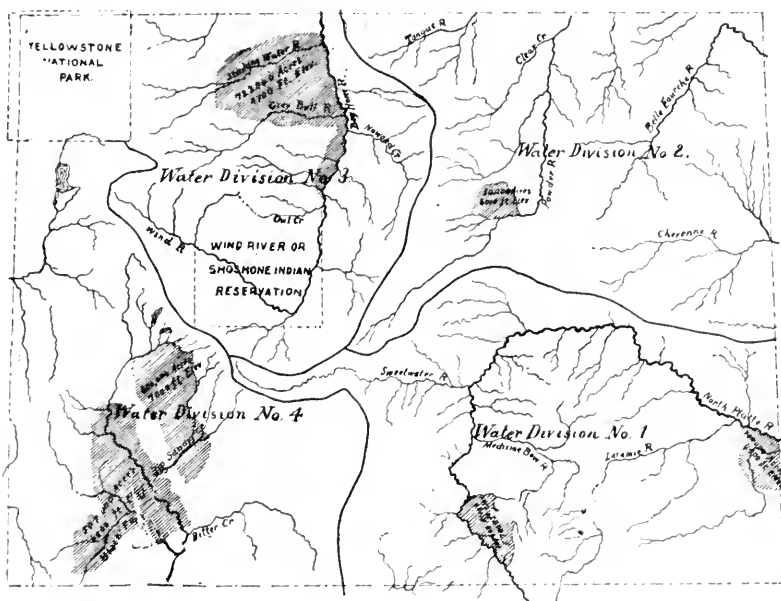
tion under the Carey Act if wise provision shall be made by the State legislature for carrying it into effect.

A STATE IRRIGATION CONVENTION.

In order that proper consideration be given the subject, a State irrigation convention should be called to meet at some convenient point in Wyoming at least one month previous to the assembling of the legislature. The county commissioners of each county of the State should appoint three persons from their respective counties, at least one of these delegates to be a practical irrigator, as delegates to the State convention. A representative of the general land office should be invited to attend and measures should be adopted after full consideration and discussion of the subject, to be submitted to the State legislature to be embodied, if no better plans are suggested, in the laws under which the gift may be utilized.

WHAT SUCCESS MEANS.

The successful reclamation and settlement of the one-million-acre grant to Wyoming means that at least \$5,000,000 outside capital will come into the State to be expended on permanent improvements. That at least \$10,000,000.00 of taxable property will be added to the State's assessed valuation. That taxes will be reduced by reason of this increased valuation twenty-five to thirty per cent. That the population of the State will be increased fifty per cent. That if from this source capital finds a profitable field of investment in Wyoming, capital will also be forthcoming to develop the natural resources of oil, coal, precious minerals and lumber which the State contains, and that within a short period Wyoming will take the place to which it is entitled in the commercial world and become a progressive rather than a retrogressive commonwealth.



SHADED PORTIONS SHOW LAND CAPABLE OF RECLAMATION UNDER THE CAREY LAW.

THE MORMON LAND SYSTEM IN UTAH.

THE SPEECH OF THE HON. GEORGE Q. CANNON AS TEMPORARY CHAIRMAN OF THE THIRD NATIONAL IRRIGATION CONGRESS.

Ladies and Gentlemen of the Irrigation Congress:

I might say truthfully that this is somewhat unexpected to me. I received notice last night on my arrival after midnight at the hotel from the chairman of the National Committee that it was contemplated to put my name in nomination as a temporary chairman of this National Irrigation Congress. I almost hope, and if it had not been for my pride in the territory from which I came, that some other name might have been substituted for mine, for in the midst of men like these we have gathered here to-day I submit that I feel a sense of modesty, and would rather sit and listen than take a prominent part in the proceedings of this congress. Nevertheless, it is probably due to Utah, in view of the attitude which she has occupied for the last forty-seven years on this great and important question, that she should occupy some prominent position in this congress.

Forty-seven years ago I crossed the plains in company with companions who were then seeking homes in the Far West. I did not occupy so prominent a position in the community as has been represented, because I was but a youth 20 years old, but I was then, as I am now, deeply interested in the future of this Western country. I felt that there was a great future for it, and then to me, as with all those who traveled at that time, it was so different to know the old conditions under which we lived that it seemed like a new world. We entered Salt Lake valley, that is, I and the party I accompanied, about eight weeks after the pioneers headed by Brigham Young had entered the valley. That band consisted of 142 men and three women. We came forward and traveled with women and children in large numbers, there being some 2,000 all told in the different companies.

THE LUXURY OF POTATOES.

The pioneers had already planted a few seeds and made some attempt at irrigation, but as they landed the latter part of July (the 24th it was) it was very difficult to do anything except to preserve the seed. That seed was carefully cared for and husbanded, and from that seed the seed potatoes (that was the first vegetable introduced into Utah) sprung. But it was not until 1849 that any of us, unless it was through curiosity, tasted potatoes. We preserved the seed so carefully that we did not dare to taste potatoes. In

1848, after planting our crops, we found that we were in such a situation that food must be raised, and as we did not have the scientific friends that we have with us now to do it in a scientific manner, we went at it as best we could, and took out water by the simplest means in our reach, and we were successful in raising at least a part of a crop. After our grain had been sown and our fields looked promising, black crickets came down by the millions and devoured our crops. I have seen fields of wheat look as promising as they could in the morning and by evening they would be as bare as a man's hand—devoured by these crickets.

For a time it seemed that everything planted would be torn up, and we were in such a position as you can well imagine. California

was on our west, 800 miles distant; to the east was no settlement nearer than Des Moines, Iowa, and a few settlements perhaps in upper Missouri, so that we were entirely dependent upon all we brought in our wagons, and we had to deal it with the utmost care. Food was weighed out by the ounce and limited to every individual that no one should eat more than his share of the pieces that were divided for the week's supply.



HON. GEORGE Q. CANNON,
Of Utah, Temporary Chairman Irrigation Congress.

I was a young man then growing, and I never worked so hard as we had to do then, and I was continually hungry during that winter; it seemed to me that I was hungry to the end of toes and fingers. I was an orphan, but I had an aunt, and she said on my birthday: "George, we will have all we can eat to-day, as it is your birthday. You invite your young friends to come in and partake with us." I looked forward to the anticipation of having a good square meal on that morning. I mention this because it is an interesting point to know that I did eat all I could, but I was hungry ten minutes afterward. The stomach having become contracted by having so small an amount of food, the system was starved and it required more than one meal to satisfy nature.

THISTLE TOPS AS GREENS.

When spring came the thistles began to grow up. Our fields produced a great many thistles. I have gone out with the boys in mid-day when the horses had come in and pulled the thistle tops for greens. It is a fact that the distention of the stomach caused by eating these thistles allayed the hunger we felt, and with the milk from the cows we soon grew fat. These crickets devoured most of our crops. I had no responsibility upon me, but I have often thought of the feelings of the men that had families under these circumstances; but there was unbounded courage. Every man felt he would stay there, no matter what the consequences might be. To us who lived in Utah about that time it seemed there was a visitation of Providence to save us. Sea gulls came by hundreds and by thousands, and before the crops were entirely destroyed these gulls devoured the insects, so that our fields were entirely freed from them. Whenever I see a boy pointing a gun at a gull I feel that I ought to knock his gun up. The bird has become sacred to me. I have gone along ditches in the morning and have seen lumps of these crickets vomited up by these gulls, so that they could begin again killing them.

The drying of this country at that time was something dreadful. It seemed as though the land was dead. I remember seeing it illustrated in the case of a grave that was dug. I was there at the time. It is now in the part of the town covered by inhabitants and it seems the ground has not been disturbed for ages. We dug a ditch, and so dry was it that when we turned the water in (some of you gentlemen have perhaps visited Salt Lake City and seen where the great coöperative store stands) and there a ditch was dug to convey the water to the fort, which was about a half mile, and it took two days for it to run that distance, the ground was so thirsty.

THE UTAH OF TO-DAY.

Now great results have followed, and I can say to-day that Utah is proud to have the opportunity of

participating in a Congress of this character. We feel the questions to be brought before this Congress are of the greatest importance, not only to this portion of America, but to the entire Union. Every man in this entire republic ought to be interested in this question which will be discussed, I hope, so freely and profitably in our Congress. It is a matter which affects not only the West alone, but the East, and in fact it may be said to affect humanity, and everything should be done in our deliberation to reach the united action so that whatever we resolve upon will be acceptable to the whole people and members of Congress.

I am glad that these deliberations take this wide course. I would like to see every person who takes an interest in irrigation, whether they live in the arid regions or the heaven-watered regions, and I hope every man will express himself with the utmost freedom, that there may be a unity of sentiment and a unity of action.

We in Utah have proved that the small holdings are the best for the people. Our pioneers, when they went into that country, arranged in the first place that men at the head of a household should receive a city lot. The city was divided into blocks of ten acres, containing eight lots of one and a quarter acres each. I remember applying for a lot and was told that I was not a married man and could not have the land. Outside the city the first lots were five-acre lots, later ten-acre lots, and later twenty-acre lots. Mechanics were expected to have ten acres. Those who were engaged in business drew ten acres if their families were large enough. It was not a law, but was suggested. Laws were then made that no man should manipulate land, so that every man in the community should have a sufficient quantity to supply his wants and to enable him to raise what he wanted, but could have nothing for manipulation. We had to set our faces against the manipulation of land and the manipulation of water. We dread above everything large companies coming in and making canals and taxing our people for the water. We do not think that is necessary. We have proved that water can be taken out and that it can be used by the poor man by a proper combination of efforts by being united. We have proved this and also that large tracts of land are not necessary for the public good. Therefore, I think I express the feeling of our people and the satisfaction of our people in Utah. But I make this statement in proof: Our conditions are different than those surrounding California, Colorado, Arizona, Montana, etc. I do not wish in making this remark to be understood that we oppose other measures. I only wish to say that it has been proven to us to be attended with the best results.

Ladies and gentlemen of this Irrigation Congress, I thank you for the honor you have done Utah in selecting me as the temporary chairman of this congress.

TALKS WITH PRACTICAL IRRIGATORS.

THAT'S THE QUESTION!

BY J. W. GREGORY.

AND what a great, complicated, intricate one it is! At a recent irrigation meeting an enthusiastic and impatient speaker protested against all talk about national and State irrigation policies, the amendment of existing laws, the necessity of agreement, coöperation, compromise among the various irrigation States, etc. He broadly intimated that all such discussion simply wasted time, and condensed the whole problem into this proposition:

"All we want to know is *how* to get the water onto our *land* so as to irrigate!"

Then, having thus summarily disposed of the whole matter in tones which rung of conscious triumph, he sat down and looked about over his subdued audience with a flash of victory in his eyes paralleled only in the case of Prof. Muddhedd, of Punkin Holler, when he propounded his clinching question:

"If d-o-r-e doant spell 'door,' what *do* it spell?"

There was no need to tell the old students of the irrigation question present that the speaker was still in the primer class, so to speak, and had the notation and numeration of the problem still to learn. They all knew it instantly. It was as if a middle-aged inquirer after knowledge should protest to an assembly of astronomers against all talk about algebraic formulae, the measurement of angles and orbits—or even the multiplication table—and wind up by declaring that all he wished to know was how to measure the distances to the stars so he could do it himself. Recognizing the futility of attempting to impart a whole common school education to such a student at one sitting, the savants would probably listen to such a criticism in silence and momentary wonder, as did the irrigators to the speaker on the occasion referred to.

EACH LOCALITY MUST ANSWER.

The question, as stated by the gentleman, does indeed epitomize the irrigation problem. It is simply a question as to how we shall put water on our land to irrigate it; and if the answer involved nothing more than watering Ephraim Goggles' quarter section down on the Arkansaw, there would be no need of holding irrigation congresses and worrying over knotty inter-state and national questions. Almost all irrigation localities abound in demonstrations as to facts suited to local conditions, so that if a single locality were concerned, the answer might be somewhere near as simple as the question; but even the single quarter section of land in the great Arkansas valley, though furnished with its own pumping plants and reservoirs, located within its own limits, may at any time find itself embroiled in a question of priority of appropriation of water, and hence vitally interested in matters of State policy at least, and possibly, in some locations, in questions of national legislation and the decisions of the United States courts, *i. e.*, matters of national policy.

THE PROBABLE COST.

Such are the possibilities—not necessarily probabilities—affecting every individual tract of irrigated land. To answer the question, how to get the water upon the land for irrigation purposes, applying it to the whole country, will fill many volumes, written by many authors and extending through many years. The attempt to begin its answer has already cost millions of money, the best efforts of eminent engineers, the active service and interest of hundreds of keen business men. Before it is answered fully and clearly, many millions more will have been expended; great systems of surveys will have been accomplished; great engineering problems will have been solved; State and national policies established, found wanting and amended over and over, these embracing a multiplicity of subsidiary issues like the forestry problem, the transportation problem, etc.; social, economic and even ethical questions will have sprung from it, and possibly governmental changes, and the far descendants of the present generation will have lost all trace of the man who could ask so great a question as glibly as though its answer was no more than telling the price of a load of hay.

WHAT WE BUY IN OTHER COUNTRIES.

BY W. C. FITZSIMMONS.

EXCEPT tropical fruits and plants, there is little else consumed as food in the United States that could not be easily and profitably produced in our own country. The most convincing evidence of the folly of American farmers raising wheat at fifty-four cents a bushel wherewith to buy foreign products at comparatively high prices, is found in the following figures of imports and exports as given by the United States Treasury Department at Washington for the fiscal year ending June 30, 1894:

IMPORTED DUTY FREE.

	Value.
Cattle, horses, sheep and all other animals, including fowls	\$ 1,080,687
Chicory (easily grown in California)	168,892
Cotton	3,010,205
Currants (small raisins from Greece, easily produced in California)	774,802
Dates, easily produced in California	387,585
Goat skins	8,170,608
Other skins	7,668,280
Fixed and volatile oils	2,250,207
Rice and seeds	1,677,438
Silk, unmanufactured	16,234,182
Sugar and molasses	126,619,809
Tea (experiments show that good tea can be produced in the United States)	14,143,107
Fibers, all of which, or others equally good, can be produced in the United States	10,579,173

ARTICLES DUTIABLE.

Cattle, horses, sheep and all others, including poultry	1,310,379
Breadstuffs, including barley, wheat, corn, oats, oatmeal, rye, etc.	1,981,317
Bristles	929,231
Eggs	199,536
Flax and hemp	1,576,763
Figs (easily produced in any quantity in California, Florida and other States)	392,040

Lemons (easily produced in any quantity in California and Florida).....	4,285,278
Oranges (easily produced in any quantity in California and Florida).....	1,127,005
Prunes and plums (easily produced in any quantity in California).....	416,342
Raisins (easily produced in any quantity in California).....	554,090
Preserved fruits.....	526,551
Almonds (California could easily supply the desired amount).....	769,453
Goat skins.....	412,603
Hops.....	484,415
Cat skins.....	384,736
Upper leather and dressed skins.....	1,622,330
Olive oil (can be produced in any quantity in California).....	909,897
Meat and meat extracts and dairy products.....	1,797,847
Rice (can be produced in any quantity in Louisiana and the Carolinas).....	2,014,896
Flaxseed.....	701,886
Tobacco.....	11,001,793
Vegetables of various kinds, as pease, beans, potatoes, etc.....	3,594,992
Wines.....	6,739,425
Wool (for the year ending June 30, 1893).....	21,061,180

This gives a total import for the year just past, of products which can be and should be fully grown in the United States, to the enormous value of \$257,782,000, or over ninety-one million dollars more than was realized for the entire exports of grain and flour. And a further scrutiny of figures furnished by the Treasury Department shows the value of imports named above to lack only fifteen million dollars of being equal to the entire exports of all grain and flour; all cattle, horses, sheep, hogs, mules, and other animals; all hay, hides, honey and hops; all manufactures of iron and steel in all forms; all agricultural implements; and all lumber and manufactures of wood of all kinds and descriptions.

While these figures do not constitute a poem by any means, they do constitute a sermon of very grave importance to every American soil-tiller, and prove beyond the shadow of a doubt what THE IRRIGATION AGE has long endeavored to impress upon all farmers and horticulturists, that American farm products need to be diversified, and that American soil tillers do not give sufficient attention to acquiring full and accurate information relative to the very things of which the Treasury figures given herein speak so eloquently and so conclusively. We plead for a broader study of economic principles as affecting agriculture by those most vitally interested in these problems—that is, by farmers and horticulturists themselves. Provincialism is the bane of agriculture almost everywhere. In the early spring reports were published that the farmers of a certain county in Kansas decided to plow under a portion of their wheat crops in order to increase the price of the remainder. It is entirely safe to say not one of these farmers was a reader of THE IRRIGATION AGE, or they would have known that plowing under any or all the wheat in any county in Kansas, or in all the counties, would not appreciably increase the price of that grain in any great market in the world. It will be seen that it required more than three-fourths of our wheat and flour exports to pay for the sugar we bought from Cuba, Germany and other countries last year. Every pound of sugar consumed in the United States, and millions of tons more, could be produced in this country and give better returns to the farmer than many of the staple crops to which he is so firmly wedded. These treasury statistics cry aloud for a more diversified agriculture, and add their persuasive eloquence to the arguments of the AGE, that the American farmer ought to produce nearly everything consumed by American citizens.

Bean Culture in California.—Ventura county, California, has the reputation of producing more beans than any other county in the United States. Not that the conditions for bean culture are necessarily the best in that county, but the farmers have the "bean habit," so to speak, and beans are planted there as banking houses are established in Wall street. Beans, then, may be said to be the Ventura county specialty, just as prunes are the staple product of Santa Clara county in that State. But the farmers of the United States have not yet succeeded in raising enough beans for the use of the people, hence a number of localities best adapted might well consider the advisability of increasing their bean acreages. Last year over a million bushels of beans and pease were imported at a cost of nearly a dollar per bushel. It is much the same in other years, and may possibly continue, in spite of the fact that beans are worth nearly twice as much as wheat and will yield many more bushels per acre. The cost of production and preparation for market is, however, in excess of that for a wheat crop of equal area.

A bean-grower of fifteen years' experience in Ventura county has found the average yield of his land to have been 1,500 pounds of marketable beans per acre annually, and the selling price has averaged 2½ cents per pound, or \$37.50 per acre.

It has been previously shown in THE AGE that the average annual value of a wheat crop is much less than the above; in fact, not much more than one-third during the past fifteen years, and during the past two years not much more than one-sixth. The grower referred to herein produced the lima bean, which is not adapted to all conditions, to be sure, but any variety of good bean will be found often to be far more profitable than some of the staple crops which American farmers continue to produce in enormous quantities with very little profit. In the bean-growing districts of California it is estimated that the equivalent of one man and four horses, with the needful farm implements, will suffice to handle eighty acres of beans. Of course more men will be needed at times, but, by proper management, it is claimed that the expense may be brought down to a moderate figure. In fact, the bean industry has so far developed in Ventura county, that raw land, considered to be well adapted to the business, is held quite generally at \$150 to \$200 per acre. It is prairie, or *mesa* land, comparatively near the ocean, and does not require expense in clearing, except to remove a growth of small brush, with sometimes here and there a tree. The land in this section, as stated above, is not superior in fertility or otherwise to large areas elsewhere, and the industry can easily be extended, somewhat, at least, in almost any part of the country. American farmers should learn more exactly what crops are not fully produced and what are already over-produced, and then gauge their plantings accordingly. It will be a part of the business of THE IRRIGATION AGE to point these things out from time to time.

Another Forage Plant.—If it be true that he deserves well of his fellow men who causes two blades of grass to grow where only one grew before, surely he who causes many blades of grass to grow where none grew before must be entitled to still higher consideration. Attention has lately been called by the Department of Agriculture to the Hungarian brome grass; and if extended planting shall justify present

anticipations of its value, this late addition to our forage plants is destined to be of great advantage, especially in the arid regions. The plant is thus described in a late publication of the department: "Hungarian brome grass (*Bromus inermis*) is a vigorous, hardy perennial, with strong creeping root-stocks, smooth, upright, leafy stems one to three feet high, and a loose, open panicle or head. It is a native of Europe, ranging from France eastward into Siberia, and grows along roadsides, river banks, borders of fields and woods, and upon sterile hillsides and pastures." Data collected by the department go to show that the grass is easily propagated, and that it should be especially valuable in the arid belt. It readily establishes itself even on thin, poor soils; and where given anything like a fair chance develops into a luxuriant plant yielding three tons of hay per acre at a cutting. The experiments thus far made show that the plant is adapted to a great variety of soils and climatic conditions, since it thrives well in Canada, as well as in Kansas, Colorado, Wyoming, California and Mississippi. While appearing to be most at home in light sandy loams, it will also flourish very satisfactorily in stiff clays, in each case forming a dense, tough sod. It is found to stand long periods of drouth better than any other variety of the cultivated grasses, and will also endure with great fortitude intense cold and extreme heat.

While this grass may not be able to supplant alfalfa for the irrigable areas, yet it may, upon trial, be found to meet all the conditions of a profitable forage plant, not only upon irrigated lands but upon those subject to drouth and which do not enjoy facilities for irrigation. In any event it is to be hoped that readers of THE IRRIGATION AGE will take steps to fully test the value of Hungarian brome in their several localities, for any plant that meets the conditions of a cheaply produced and nutritious forage is of the highest value to American agriculture. This grass should be cut when first coming into bloom, because if delayed beyond this time the stems, like those of timothy, rapidly become hard and woody and nearly valueless for hay. It is expected, however, that brome will be most highly valued for grazing purposes, and in the more southern latitudes it remains green throughout the winter. It gives promise, therefore, of affording good winter pasturage throughout a large area of country, and if this anticipation shall be fulfilled its general introduction will prove of incalculable benefit to agriculture. About thirty to fifty pounds of seed per acre are sown, and it may be sown in the fall with winter wheat, or in the early spring. Seedsmen in the larger cities can generally supply at least limited quantities of the seed, and it should not be mixed with other grasses, as its strong growth tends to choke out any other grass that may be sown with it. It is recommended to be sown also along ditches or streams for holding the banks from wash or caving.

Sing "Hey" the Feathery Plume!—Mrs. Harriet W. Strong, an enterprising lady residing in Los Angeles county, California, has become well known in the past few years through making a specialty of the introduction and utilization of the pampas grass. It was through her efforts that pampas became a feature in the last presidential campaign, and she also originated the pampas plume palace at the World's Fair. Recently she has published arti-

cles to show that this famous grass is good for very much more than mere ornament. She calls attention to the fact that, on its native plains in South America, it is the food of great herds of fine cattle, and claims that it is more nutritious than alfalfa. Horses are said to be very fond of it. It is also claimed that rope may be made from the fiber of its husk, that the beautiful, feathery plumes may be made into a bank-note paper, which water will not destroy, and that the roots may be made into a flour of considerable value as food.

Every visitor to Southern California has witnessed the remarkable growth this grass makes when set in bunches for ornament, and well irrigated. Mrs. Strong says that on dry uplands it grows to a height of from eighteen to twenty-eight inches; that where it is cut down by frost in the winter it springs up again in the spring, but makes a shorter growth. It has been planted in America as far north as Kentucky for ornament, and plants of it have been grown in Connecticut; but Mrs. Strong sweepingly declares that it may be grown in every part of the United States. An advocate so enthusiastic ought to be able to develop the plant into a valuable addition to the list of irrigating products.

Feed the Pigs.—At this writing, nearly all market reports show this condition throughout the country: cheap wheat and dear pork. Shrewd farmers will take advantage of this fact and feed as many hogs as possible with the wheat which, marketed in a raw state, will scarcely bring the cost of production. In some sections of the country a sentiment prevails among farmers that it is wrong to feed swine and other stock with the same grains that nourish the children of the family. But all this is purely sentimental, and has no proper place in the mind of any progressive agriculturist. It is merely a matter of business. All food products are composed of certain chemical ingredients, and one combination of these elements is no more sacred than another. The question of expense and expediency is the only one that can possibly have a place in any business man's mind in this connection. If wheat is the cheapest food for swine, or sheep, or cattle, or turkeys, it should be utilized to the fullest extent for that purpose; and if corn is a cheaper fuel than coal, it may properly be used as such. This is a good year to test fully the advantages of feeding cheap wheat to hogs and other stock.

Cheap Grain and Costly Fertilizers.—Tests made at the Ohio Experiment Station, covering a period of six years, have demonstrated that wheat and corn, at present prices, cannot be profitably grown by the aid of commercial fertilizers at the current market price for such substances. The experiments referred to appear to demonstrate that good drainage and thorough cultivation are the necessary preliminaries to profitable agriculture in any of its departments, and that expensive fertilizers of any kind should be applied to those crops only in whose cultivation there is some hope of a legitimate profit. The conclusions reached by the experiments with various fertilizers are thus set forth by a bulletin from the station:

"At present prices of cereal crops and of fertilizing materials respectively, the profitable production of corn, wheat and oats by the aid of chemical or

commercial fertilizers, or of barnyard manure, if its cost be proportionate to that of the chemical constituents of fertility found in commercial fertilizers, is a hopeless undertaking, unless these crops be grown in a systematic rotation with clover or a similar nitrogen-storing crop. The poorer the soil in natural fertility the smaller the probability of profitable crop production by means of artificial fertilizers."

Winter Irrigation.—The importance and value of irrigation in the fall, winter and spring are becoming more and more apparent to farmers, especially in the warmer portions of the country and on the Great Plains. A farmer in southern New Mexico says: "It cannot be too earnestly impressed upon the farmers of the far West that the more irrigation accomplished before the warm weather comes, the better will be the results of the year's cropping. In those regions where a wet winter has prevailed a successful crop will invariably follow, but as many sections have but little rain or snow fall during the winter, it is the more important that the ground should be thoroughly saturated in the spring. It is then in condition to respond to the surface water promptly, and will absorb a very much larger proportion of the water put upon it during the warm weather. The evaporation, owing to the winds, will be less and the plant will make more root, and consequently have more vitality. Especially should the alfalfa fields have early and thorough watering. The rapid growth of the first crop and its consequent thrift at the time of cutting will have its influence on all the subsequent crops of the year."

In many localities fall and winter irrigation of various fruits have been productive of most satisfactory results. Again, there are localities where irrigation in the late fall and winter has totally destroyed alfalfa fields. We should be glad to have the experiences of practical irrigators along these lines for publication in this department of THE AGE.

Wind Power.—A universal source of power which is often neglected, is that of the wind. Every farmer, however small his acreage, should have one or more good windmills. Windmill power is probably the cheapest and most readily available of any within reach of the farmer, for the lighter work about a farm, to which it may be adapted. Pumping water for stock or for irrigation by wind power has become almost a necessity in many parts of the country, and if proper appliances are added, the windmill may be most profitably used for grinding feed, for elevating hay and other produce to storage quarters in the barn, and for many other purposes. With adequate reservoirs or tankage, it is surprising how much water may be stored for irrigation by means of pumps worked by wind power. Elsewhere something has been said about the probabilities of utilizing a fraction of the present year's wheat crop as feed for stock. To get the best results from such feeding, the grain should be ground, even if but coarsely. There are few farms anywhere that cannot command sufficient wind-power to grind a considerable ration of grain each day, but by means of storage bins, which can be filled at favorable times, a good supply of ground feed may be kept on hand. Most of the best mills are now to be had at reasonable prices, which are much below the cost of less efficient machines a few years ago. Iron and steel

enter now so largely into the manufacture of windmills, that a farmer may regard it almost as a permanent investment the money he expends for a windmill.

To Prevent Hog Cholera.—One of the expensive drawbacks to the breeding of swine on a large scale in most parts of the country is hog cholera, which reduces the profits very materially at times. A great many remedies have been prescribed, but we believe none has yet proven itself infallible. A comparatively cheap and simple remedy for this terrible disease is given by an Iowa farmer, who alleges that though thoroughly tested for a number of years, it has never failed to prevent or cure the disease.

REMEDY FOR HOG CHOLERA.

"To six quarts of air-slacked lime add one quart each of powdered sulphur and common salt. Stir well together and place in a long trough in a dry place where the hogs can have free access to it. Keep such a mixture in the trough throughout the season and the hogs will not have cholera."

In using this mixture in any large quantity it will be found much cheaper to buy the sulphur by the barrel, in which case it will come quite cheap. Whether this remedy shall prove wholly efficacious or not, the cost of experimenting with it would be light, and no harm could result from giving it a trial. It is quite probable, indeed, that hogs would be the better for such treatment, whether or not cholera be among them.

The Hay Crop.—The area under hay in the United Kingdom is given at 8,600,000 acres, and the yield for this season is estimated at 13,000,000 tons, or, say, a ton and a half per acre. Last year the yield was but little over a ton per acre, and large importations from this country followed the short crop in England. Prices ruled high last season, and were quoted as high as \$38 per ton. Figures covering some nine years show the average crop of English hay to be nearly one and one-half tons per acre, which is a little above the reported average yield of the United States. Last year 49,613,469 acres were devoted to hay in this country, and the yield was authoritatively placed at 65,766,158 tons, valued at \$570,882,872. Next to corn, hay was last year the most valuable crop produced in the United States when considered as a whole, while if regarded in the light of its per acre value, it exceeds that of the corn crop by more than forty per cent. Its aggregate value was more than two and one-half times that of the wheat crop, and its per acre value more than eighty per cent. greater than wheat.

Unseasonable weather during the past summer cut down the yield of hay considerably, so that the export trade in this farm product is not likely to reach the magnitude of last season. For the year ending with June last, the exports of hay from the United States reached 54,431 tons, valued at \$890,503 against 33,084 tons, valued at \$519,640, for the preceding year. Although these exports are regarded large, it will be seen that after all the quantity sent out of the country was really insignificant compared with the entire product of hay in the United States.

Sugar Beet Pulp for Stock.—The great value of sugar beet pulp as a food for stock has been quite fully tested by Mr. Richard Gird, of Chino, Cal., and he finds the results most gratifying. His experience

as a beet grower has assured him of the possibility of raising as many as twenty-seven tons of beet roots on one acre of land, the beets averaging fifteen per cent. sugar. Mr. Gird, therefore, concludes that in no other way can so large an amount of good stock feed be produced on a given area of land. He finds that the beet pulp after parting with all the sugar which the best appliances in the great Chino sugar factory have as yet been able to extract, still contains nearly one per cent. of sugar, or, say, twenty pounds of sugar per ton of pulp. Even this he finds to serve well as a food for fattening stock, and cites in this connection the following experience: On December 16th last, he put twenty steers into a separate corral and fed them for forty-eight days with about seventy pounds each of beet pulp that had passed through the sugar factory, and about five or six pounds of hay or straw with which to form a cud. He found that at the end of the forty-eight days each had gained about 133 pounds, which Mr. Gird regards as quite satisfactory. But if the pulp deprived of nearly all its carbohydrates proved so valuable, what might not be expected from the beets with all their sugar contents served as a ration for cattle being fed for market?

Dairy Cows.—An experienced dairyman, writing to the *Country Gentleman*, gives the following ration for Jersey cows kept in the dairy: Three pounds chopped hay, three pounds wheat bran, two pounds corn meal and one pound linseed meal. This should be fed one-third in the morning and two-thirds at evening. It should be well moistened before serving. The experience of most practical dairymen who have fully tested it is, that milch cows, to give the best possible returns, should be fed each day as large a ration of suitable food as they can properly digest. In fact, this principle holds good all along the line. Teams poorly fed do indifferent service, and stock poorly nourished fails to develop into profitable animals either at the farm or in the market.

Farmers in the irrigated regions, more than elsewhere perhaps, should use the utmost care in the selection of breeds and individuals in stocking their farms, however large or small. As a rule, pasturage, except on small areas, will not be generally resorted to on irrigated lands. Better results can be obtained by feeding under cover and away from the disturbing influence of insects and bad weather. It becomes then of the highest importance that only the best animals be kept, and they kept in the best possible condition. No scrub stock of any kind should have a place on any irrigated farm. It costs but little, if any, more to feed the best individuals of the best breeds of all kinds of stock than it does those of an inferior type, and the selling value of the former is always very much greater.

Corn Stalks as Forage.—In all the corn-growing States an immense waste of good forage is annually seen among farmers generally. Sometimes the corn is not cut at all, but is husked as it stands in the field and the stalks allowed to dry up or otherwise become of little value as stock feed. In other cases the corn is "topped" at considerable cost, leaving the butt of the stalk holding the ear of grain still standing in the field to be handled again in the husking. Among the more advanced farmers, however, these old-time methods are being abandoned and modern appliances used for harvesting and utilizing the crops. Much corn is now cut by horse

power, and this is found to greatly lessen the expense. By carefully observing just the right stage of maturity in the cutting, the value of the stalks for feeding is considerably increased; and if, instead of husking, the corn be put through a threshing machine, the same as wheat, the result is still more satisfactory. By this means the grain is shelled from the cobs, the stalks are broken into edible fragments and the whole is carried by the machine, the grain to sacks and the fodder to the stack or mow. A number of practical farmers who had tried these methods of harvesting and preserving their corn crops, recently gave testimony in a leading agricultural journal to the effect that corn thus treated becomes a much more valuable crop than if handled by the old methods. The value of corn fodder thus treated was estimated to be greater than that of timothy hay, whether for cattle or horses. When passed through the thrasher, the stalks were found to be in such condition that they were eagerly eaten, and very little waste was observed. If, then, the mere operation of passing through a thrasher at once shells the corn and puts the fodder in condition to be consumed without waste, the practice is certainly to be commended.

The First Irish Potatoes.—Irish potatoes, so-called, were of American origin, as were also Indian corn and tobacco. It is a matter of historical interest that Sir Walter Raleigh, who had a passion for gardening and was successful in that direction, whatever may be said of his character and ability as a colonizer in distant lands, was the first to produce an edible tuber on European soil. Some three hundred years ago Sir Walter, while living on his estate in the county of Cork, Ireland, planted some tubers brought from America in his garden at Myrtle Grove, and from this sprang the potato industry of the world. Although the doughty knight insisted that the strange tuber was good to eat, the simple country folk of the time would have none of it, and ranked it as a poisonous plant, like the tobacco which Sir Walter had also brought from strange lands beyond the sea. Gradually, however, the prejudice was overcome, the tuber was found to be well adapted to the new conditions, and before many years it had become the staple food of the Irish people, which rank it holds to this day. Hence the name, Irish potato, known in all civilized countries and contributing to the food supply of more than half of all mankind. Germany produces more Irish potatoes than any other country, and her crop last year was reported as high as nine hundred million bushels. The crop of the United States has seldom, or never, reached above 175,000,000 bushels; but it may be said, too, that the crop in the United States has seldom, if ever, been sufficient for the home supply.

Best Breeds of Swine.—Relative to the best breeds of swine, Mr. James Anderson, a prominent breeder at Guelph, Canada, speaks as follows:

"We have now the large, improved Yorkshire, which delights the eyes of the pork packer, with his large, deep sides, fine rounding hams, and perfect loins. Then comes the Berkshire, easily fed, and early maturing, which, for a general-purpose pig, if you procure the right stamp, holds its own with any of them. Then we have the Essex and Suffolk, which I would call the family pigs. When lard is as greatly valued as hams and bacon, these are the two breeds that will lay it on to perfection with very little

feed. We have also the Poland Chinas, the Chester Whites and the Duroc-Jersey, which seem to be the favorite breeds in the corn-growing districts in the western States."

Nearly all the above named breeds have been found valuable on the irrigated farms of the West. They thrive well on alfalfa pastures, and stock hogs have often been kept in good, growing condition on a liberal diet of alfalfa hay. A favorite method of turning hogs into gold coin in the irrigated districts is to allow them to feed on the growing alfalfa until the early autumn, when they will generally be found in prime condition, and require only to be "finished off" with a ration of grain for a few weeks to make very desirable pork. In California, Arizona and other sections where corn is not a staple crop, barley or wheat is fed with profitable results. It is generally found to be more profitable to feed ground grain of any variety than to require the animal itself to do the grinding. As a matter of fact, a considerable amount of pork is every year placed upon the market which has been fattened on alfalfa pastures alone and without the aid of grain of any kind.

Pasture Grasses.—Bulletin No. 33 has just been issued by the Experiment Station at Logan. It treats of the "grazing values of varieties of grass," and "drilling versus broadcasting grass seed." The grazing experiment has been carried on for two years on upper bench gravelly soil. In 1893 a steer was kept on each of the half acre lots used during the whole summer; while in 1894 two steers were put on each half acre in the latter part of May, and the lots quickly eaten off. This gives a test of the lasting qualities of the different grasses, as well as a test of their early growth.

Two points are brought out prominently of practical importance. The first is that lucerne comes seventh out of a list of nine for an all summer pasture, and only gets to second place as an early pasture. This strongly indicates that there are several grasses better for pasture than lucerne. The other point is that a "mixture" of grasses gave nearly double the gain of any of the common grasses alone.

The bulletin is summarized as follows:

"A mixture of pasture grasses proved very much superior for grazing steers to each one of the grasses sown singly.

"Of the single varieties, tall oat grass leads, with timothy second, and lucerne third.

"The results indicate that the difference in the pasturage value of the several grasses is very marked."

The drilling of timothy seed, as against broadcasting, gave an increase in yield of hay of about eight per cent.

There was found to be less moisture in the drilled area than in the broadcasted area, though this fact may not be unfavorable.

Temperature slightly favored the drilled area.

The Small Irrigated Farm.—Upon the subject of the small irrigated tract, an experienced observer remarks that a farmer with five acres of land, and no more, if that five acres is irrigated, can keep two horses, two cows, a good poultry yard and half a dozen hogs. He can also market a large amount of vegetables, small fruits and winter fruits, can make a comfortable living, and in ten years have a good home and a bank account. If he has one hundred and sixty acres of land, five acres of which is irri-

gated, he can become rich. More men will succeed with five acres than with one hundred and sixty. This is because it pays to do well what is worth doing at all, and one man cannot care for one hundred and sixty acres as it should be. Most men will do better where they look after their own farms and do their own work than where they entrust it to others. Nine-tenths of the failures in every department of human effort and industry come from inability to successfully operate hired labor.

Wheat for Hay.—These days of low prices for wheat, it will be interesting to many of our eastern readers to know that in portions of California wheat is sown thickly and cut green for hay. A resident of Kern county, recently describing farming operations there, where the wheat fields are irrigated from artesian wells, mentioned one tract of 340 acres which was sown thickly with wheat which was cut for hay yielding from one to four tons of feed per acre. When carefully put in and well irrigated, a yield of four tons per acre is counted on with certainty. One advantage of growing such a crop is the fact that after the wheat hay is off the ground the same field may be immediately seeded to sorghum, or some similar forage crop, and a second fine crop of feed secured the same season.

Flies in the Stables.—In almost all parts of the country the fly pest in summer is to be dreaded. Of late years, however, wire or cloth screens placed at the doors and windows of dwellings have tended greatly to relieve families from the annoyances and discomforts caused by flies. In this age of the world it should be regarded as an evidence of want of thrift, or even of culture, to allow dwellings to be overrun by filthy insects, at once annoying and disgusting to a person of refinement. A little effort properly put forth in attaching screen doors and windows will not only add very greatly to the comfort and health of a family, but will be amply rewarded in the æsthetic results sure to come to the children of the family in the course of years. Rooms swarming with flies suggest untidy lives and slipshod methods, and are certainly discredit to any American family.

But flies should be kept out of the stables where the work horses and milch cows are housed, also. It is a needless suffering to which these faithful animals are almost universally subjected, and a proper show of a humane spirit could be made in suppressing flies in the stable. It can be done, and has been in a good many cases by those who have not only a humane disposition toward noble animals, but also an appreciation of the commercial value of the undertaking. Wire screens should be placed at the doors and windows of the stables, and every precaution taken to relieve the animals in the stalls of the terrible discomforts caused by swarms of flies. It is well known that cows give less milk in the fly season, and that work horses almost always lose flesh and do less satisfactory service. It becomes, therefore, a question of importance from a financial standpoint, to say nothing of the dictates of a higher civilization, to provide the quarters occupied by cows and work horses especially, against invasion by swarms of insects. Every appliance, therefore, within reason should be employed to bar them out; and in addition to the screens mentioned fly papers found effective in the household should also be used liberally about the stables. Such precautions as may be taken to pre-

vent the manure heaps from being the fertile breeding grounds of unnumbered hordes of insects should be observed. One progressive farmer in Kansas even goes so far as to cover his manure heaps by means of fine netting to prevent the entrance of flies to deposit their eggs. He finds this an effective preventive, when added to the other precautions he takes with his stables and other outhouses.

As a matter of fact, it is not difficult to prove that protection against the fly nuisance, both in house and stable, is not by any means an impossible task, and that it pays large dividends in cash, as well as comfort, upon all time, labor or money spent in erecting effective barriers against this great, but controllable, evil. It is hoped that the intelligent and progressive rural clientele of *THE IRRIGATION AGE* will set a humane and otherwise praiseworthy example by excluding flies from both dwellings and stables, for it can be done if properly undertaken.

Experiment Stations.—One of the instances in which "book farming" has proven of immense benefit to farmers, and indeed to the whole country, is that wherein Professor Snow, of the Kansas State University, inoculated chinch bugs with a deadly disease and then turned them loose among their fellows. The result was to spread the disease, and thus destroy chinch bugs by the million. In one year it is estimated that the farmers of Kansas gained over \$200,000 on their wheat crop alone by reason of this wholesale destruction of the devastating chinch bug. In nearly every state there are certain political demagogues who decry the value of the Agricultural Experiment Stations, and in some cases these men have succeeded in making farmers believe that they are not "practical," and should not be supported by a taxation of the people. Of course such men do not make effective protest against any sort of reckless appropriations for unnecessary purposes where they may profit by them, but try to make cheap capital among those farmers who oppose "new fangled notions" in agriculture. Farmers should strengthen the hands of the Experiment Stations by every possible means. They are doing a better work for the country than all the glib tribe of demagogues ever can do, and they are doing it at comparatively small expense. Every Congressman from a farming district should be compelled to pledge himself to uphold the proper work of the Stations, and to favor reasonable appropriations to that end, or suffer defeat at the hands of the farmers.

Feed Wheat to Swine and Poultry.—Low priced wheat is an inevitable necessity again this year. There is little hope of paying prices for that crop in its raw state in any market in the world. It is well known that *THE IRRIGATION AGE* has taken the ground that, so long as American farmers persist in producing two hundred million bushels of wheat to be sold annually in the British markets in competition with that grown by the cheap labor of India, Russia, Egypt and Argentina, they must expect low prices. At this writing the day of good prices for wheat appears very distant. Immense areas of new land are being planted with wheat each year, and the available areas for that staple which have not yet been touched are very great. It would seem, therefore, that if our farmers still continue to produce a large surplus of wheat, they must devise better means of realizing a living price for it than merely sending it to market as raw material.

In some of the Northwestern States where wheat has been very plentiful and money scarce of late years, many progressive farmers have made money by feeding wheat to stock. It is found to be excellent food for work horses, and swine may be readily and cheaply fattened with it at present prices in many districts. It would, therefore, seem to be good business policy for those farmers, either in the arid belt or elsewhere, who find themselves "long" on wheat, to use a market term, to utilize it by feeding stock. It is a reasonable suggestion that at the present prices of pork and poultry, for example, wheat can be made to bring eighty cents to a dollar per bushel, and perhaps more if marketed as a manufactured product rather than as raw material. If properly distributed, there certainly could be found a market for several times the number of turkeys, capons and other first-class poultry that are now annually sold. Ground properly, wheat may also be largely used as food for dairy cows. The testimony of a number of reliable dairymen is to the effect that when properly fed to the right kind of dairy cows, wheat will almost certainly yield a return equivalent to a dollar per bushel. Along these lines there is an outlet with some hope of fair profit for a part of the immense surplus of wheat which has already filled the markets of the world, and awaits tardy final purchasers at prices below any reasonable profit in production.

Mushroom Bed.—Mushrooms are everywhere considered to be a delicious and wholesome article of food, but it is generally believed that they are provided only at great trouble and expense. In France and other places they are extensively grown in natural or artificial caves, and it is generally thought that much of the ordinary daylight must be excluded for best results. In some places in the United States, however, they thrive remarkably well among timber, especially where the ground is suitable and the shade not too dense. But most farmers can readily produce this toothsome fungus by a little care and attention and will be amply rewarded by a very valuable addition to their list of table delicacies.

Sugar Beets in Washington.—The people of eastern Washington count upon being able to successfully produce sugar beets in that region. Prof. Elton Fulmer, of the State Agricultural College, has been making tests from which he appears to conclude that the crop may be grown in that State for sugar-making—the sugar trust permitting, of course.

Poultry Manure.—An irrigation farmer in southern Colorado lays great stress upon the value of manure from the poultry house, especially in the production of cabbage, which he claims is greatly stimulated by the direct application of such manure in quantities which would injure most other crops.

The eastern farmer who fences against nothing smaller than a "shoat," and the western farmer who fences against nothing at all, will alike be interested in the fact that, in portions of California great fields of irrigated grain, containing hundreds of acres in some instances, are fenced against rabbits.

An insect pest, an aphid, allied to the fruit louse, did some damage to wheat fields in eastern Washington this year, but its ravages seemed to be checked by the advent of hot weather.

HORTICULTURE BY IRRIGATION.

IN THE PRUNE BELT.

BY W. C. FITZSIMMONS.

PRUNE culture in the United States dates from 1856, when M. Pierre Pellier, a nurseryman of San Jose, California, returned from a visit to his old home in France, bringing some prune cuttings from Ville Neuve d'Agen. From that beginning the prune industry of California, and indirectly throughout the Pacific States, took its rise. The prune generally grown is the same variety introduced by M. Pellier, though other kinds have been planted on a considerable scale in various parts of the prune growing region. From California the industry spread to Oregon, Washington, Idaho and some other States and Territories, though beyond the three States named the acreage is comparatively small.

ACREAGE.

At this time California has over 50,000 acres devoted to prunes, and the planting of new orchards goes merrily on. The Santa Clara valley, wherein the first prune trees were planted, as above noted, is by far the largest producer of prunes in the United States. Nearly forty million pounds of the cured fruit were shipped from that region last year, and the crop this season is estimated at thirty million pounds. Other districts in the State will bring the entire output up to forty or fifty million pounds, probably. Oregon claims a prune acreage of about 25,000 acres, but as the orchards are generally young the product this season is estimated at only 3,500,000 pounds. Washington is reported to have about 10,000 acres devoted to prunes, and Idaho 5,000 acres. The yield of the Washington orchards for the present season will probably reach 1,500,000 pounds of cured fruit.

CURING.

Most prunes grown in California are cured in the sun, while those grown in the States farther north are largely cured in evaporators. Each method has its advantages and each has its strong advocates. The prune is produced and prepared for market at less expense than most other deciduous fruits, and hence is a popular fruit to plant wherever suitable conditions of soil and climate are found.

In view of these facts it is not unlikely that the prune will be over-planted soon, and that the profits of prune culture will decline in a proportionate degree. While the area suitable for the growth of prunes is very large, there is not an unlimited market for the product; hence with the continual expansion of the prune growing area the time will soon come when production will greatly outrun consumption, at least at prices which will prove remunerative to the grower.

In order to fortify this statement by an array of facts and figures, it may be mentioned that the following tables show the production in California (thus far the production of prunes elsewhere in the United States has been inconsiderable) for a series

of years; also the quantities imported during the same period.

YIELD OF CALIFORNIA PRUNES.

Year.	Pounds.
1886.....	2,000,000
1887.....	1,825,000
1888.....	2,100,000
1889.....	15,200,000
1890.....	12,000,000
1891.....	27,500,000
1892.....	30,000,000
1893.....	51,716,000
1894 (estimated).....	45,000,000

IMPORTS OF FOREIGN PRUNES.

Year.	Pounds.	Value.
1885.....	57,631,820	\$2,147,505
1886.....	64,995,545	2,026,595
1887.....	92,032,625	2,999,648
1888.....	70,626,027	2,197,150
1889.....	46,154,825	1,423,304
1890.....	58,093,410	1,789,176
1891.....	9,336,859	470,360
1892.....	23,177,617	951,444
1893.....	16,428,388	756,247

It will be seen from the above figures that the average home production for eight years (1886 to 1893) was 17,792,000 pounds of prunes, and the average annual importations amounted to 48,719,679 pounds. The sum of these two quantities gives us a nearly accurate guide to the total annual consumption of cured prunes in the United States, which amounts to about seventy million pounds. No doubt the consumption is increasing, and doubtless, too, more rapidly than the population. Making allowances, however, for a large increase in both these directions in the coming years, it is unreasonable to expect a total annual absorption of more than one hundred million to one hundred and twenty million pounds of prunes during the next five or six years, at least. As a matter of fact, however, not one half of the acreage, even in California, has reached the full bearing stage, and a much smaller proportion of the total area planted in the other States named; hence it seems a reasonable deduction that within five or six years we shall be called upon to market a crop of probably two hundred million pounds of prunes.

In view also of the fact that France, Servia and Bosnia already produce more prunes than can be marketed profitably outside of the United States, it would appear to follow that our main reliance for a market must be in our own country. But can and will the people of the United States consume three times as many prunes as now and at such prices as will leave a living margin to producers? These are the questions before prune planters, and perhaps one man's guess in this connection may be as accurate as another's. In any event, the past and present facts of the prune industry are here presented, and if carefully studied will prove a valuable guide to planters and others interested in prune culture or prune consumption.

STRAWBERRIES BY IRRIGATION.

MR. B. F. SMITH, of Lawrence, Kas., is a most intelligent and enterprising horticulturist. Although located in the eastern part of the State, which receives what is considered abundant rainfall for all agricultural purposes, according to old stand-



MONTROSE COUNTY, COLO., FRUITS.

ards, he has had this season a practical self-taught lesson as the value of irrigation, even in a humid region.

In a recent number of *Smith's Fruit Farmer*, he gives an account of the lesson referred to. If similar experiences, the past season, of farmers and horticulturists the county over, could be collected and published, they would constitute a valuable addition to the practical experience and suggestions helpful to irrigators in general. *THE AGE* would gladly receive accounts of such experiments from all sources for publication. Mr. Smith tells his experience as follows:

THE TEMPTATION.

"From the first laying of the city water pipes along the street near one of my berry patches, I have desired an excuse to experiment with water applied to strawberries during the ripening season. The drouth in April and May presented the opportunity to try a little irrigation scheme, different from any I have ever heard of in the west.

"It was about the 10th of May that I observed that my strawberry plants were starving for water. I then sought for information about the cost of pipes, hose, etc., from a reliable pump and water fixture man of Lawrence. He figured quite a large bill for pipe to be laid two and one-half feet below the surface of the soil. I hesitated at the expense of ditching for pipe and suggested laying it on top of the ground, as I had no use for the water in the fall or winter season. I found the pipe could be thus laid at considerably less expense, and that I could remove piping after the summer season was gone.

LAYING PIPE.

"So I laid the piping on top of the ground along the roadways through a two-and-a-fourth acre berry

patch. Three hundred of the five hundred feet of pipe used is common inch iron, and two hundred feet, half inch galvanized iron pipe. At intervals of about one hundred feet are water cocks or faucets for attaching a three-fourths-inch rubber hose. This hose being one hundred feet long enabled me to reach the entire berry patch. Beginning at the first faucet, I watered all within reach of it, then moved the hose to the second faucet, and so on till the whole patch was watered.

LEARNS A LESSON.

"At the commencement of the experiment I used a nozzle in the manner that we water our lawns; but soon discovered that the better way was to dispense with the nozzle and let the water run out of the rows of berries from the end of the hose. The water was thus applied at the rate of about a gallon to every twenty inches in length of the row. This amount of water thoroughly soaked the rows, but not the entire space between the rows, which is not necessary to the well ripening of the berries, as the water supply is wanted among the roots. Then to have watered the two feet space between the rows would have taken double the amount of water, with no addition of fruit.

"The irrigating was all done at night. The time taken to go over the patch was twenty-eight hours and the cost to apply the water ten cents per hour. I used 16,000 gallons of water the first application and 10,000 gallons the second application. There was an interval of a week between the waterings. The water company charged fifteen cents per 1,000 gallons.

THE RECKONING.

"The piping and hose cost me \$60; water, \$5.25; application to the plants, \$5.60; total, \$70.85. I got the water plant ready to work May 19. Up to that time I had picked the patch over three times, and in my estimate of the crop by those pickings, I would have gotten about seventy-five crates off the patch, but with the use of water I gathered 225 twenty-four quart crates of berries. In fact, 150 crates might be placed to the credit of my irrigation experiment. One hundred and fifty crates at \$2.10 per crate, the average of the crop, figured up \$365. Subtracting the water expense, \$70.85, we have left to the credit of Kaw river water, \$294.15. Had there been no kill-



HOME OF A FRUIT GROWER.

ing frost in May, and had I applied the water ten days sooner than I did, I honestly believe this berry patch under irrigation would have yielded 400 crates of berries.

"Now these irrigating fixtures will be housed in the barn the coming winter, and replaced early next sea-

son, and in the event of a dry season during spring time they will be ready for use.

"From what I have learned in this little experiment, I will introduce water appliances to my Highland berry farm in the near future either by pipes from the city water plant or by well and wind mills. I firmly believe that our berry crop can be quadrupled by the use of water on berry plants at all dry times during the season of plant growth."

PROFITABLE SAFEGUARDS.

The evaporating establishment and the canning works are to a fruit-growing community a sort of a safety-valve, cold-storage, or insurance arrangement. It may often happen that a crop of perishable fruit will be wholly lost, or nearly so, because of something which hinders marketing at the instant the fruit is ripe. Berry growers in parts of California this season lost their whole crop by reason of the great strike stopping all trains so long that their fruit rotted in the crates awaiting shipment. Sometimes a glutted market is almost equally disastrous. Large growers, or communities of those operating in a small way, would doubtless be well repaid in the long run by being prepared either to evaporate or can, or both, a heavy crop of good fruit when, for any reason, remunerative prices for the fresh product in open market suddenly fail.

Remedy for Pear Blight.—The greatest drawback to profitable pear culture in almost all parts of the country is blight. Trees are affected by blight in nearly every part of the United States, and the disease does not respond readily to most of the treatments adopted. Like peach yellows, pear blight, if not incurable, is at least generally regarded as exceedingly difficult to cure. The result is, that orchards are allowed to go on from year to year producing but little fruit, and that of very inferior quality, thus to a great extent bringing pear culture into disrepute in many sections. To be sure, a great number of so-called remedies have been applied from time to time, and some of them have undoubtedly proven in a measure effective, but a sovereign remedy for pear blight is among the things still to be desired. In a discussion before the Missouri State Horticultural Society some months ago, Dr. J. Henesley gave a prescription for pear blight which he had tested quite fully with the greatest satisfaction.

THE REMEDY.

The remedy prescribed by Dr. Henesley was simply calomel, a substance widely prescribed by the profession for various ills of humanity, and composed of two equivalents of mercury and one of chlorine. It is a drug familiar to all and to be found in every drug store. The dose, which should be about ten grains, is administered by cutting across the trunk through the bark, then lifting the edges and inserting the calomel. The wound should be bound up by a piece of cloth of some kind to aid it in healing. Trees should be treated during the growing season, when it is found that the medicine is readily taken up in the circulation and its good effects soon made manifest.

This treatment is here recommended, not with the positive assurance of its efficacy in curing the dread disease known as pear blight, but in the hope that it may prove of value. The mode of treatment is simplicity itself, and the cost is merely nominal; hence any who wish to experiment may do so without loss

or heavy expense, and in the light of the experience of Dr. Henesley and of others cited by him, with reasonable hopes of success. It is hoped that many readers of THE AGE may make experiments with the calomel treatment and report results to this department.

Raise Fruit.—"In this era of low prices," says the St. Louis *Globe-Democrat*, "one article of general production on the farm stands forth a decided exception. The average wholesale price of apples in New York for the past season was \$4.50 a barrel. Thus, a barrel of good apples was worth the same as $7\frac{1}{2}$ bushels of wheat. If it be remarked that the apple crop of last year was unusually short, the fact may be cited that apples in the season of 1892-93 brought \$2.50 a barrel at wholesale in New York, and this price is the equivalent of more than four bushels of wheat. The farmer who is not looking after his apple orchard in these times, enriching and extending it, is missing what seems to be his best opportunity. No glut of fine apples need be feared. Large quantities of American apples are demanded in London, the price for No. 1 ranging from \$5 to \$8 a barrel. The fast ocean steamers make special provisions for the fruit, and a shipment of 8,000 barrels on one steamer is on record. While the English prize most our Newton Pippins, Northern Spys, Baldwins and Russets, they have learned the value of all good varieties, and shipments now begin as early as August. A well-flavored red-skinned apple is the favorite with the English masses. The sight of a neglected orchard on a farm is woful evidence of a business misunderstood."

It will be a long time before the production of good apples is overdone, if it ever is. And the same is true of the other leading and staple fruits. The demand for these products is increasing faster than the supply. It will be impossible, for many years at least, to have too many pears, plums, cherries or peaches of good varieties. Even at prices quite a little below the average of late years, fruits will pay; and should prices lower but a little, consumption will increase so rapidly as to check the downward tendency. More and more attention to fruit growing will pay.

Pineapple Culture in Florida.—A comparatively limited area in the United States is adapted to the successful culture of the pineapple, and practically all of this area tested lies in the State of Florida. Experiments in raising pines on a small scale have been tried in various parts of California, but thus far the business has not proven a commercial success. The pine requires a climate free from severe frosts and cold winds, and the Indian river region in Florida has been found to comprise more desirable conditions than any other fully tried with this crop. For the season to July, the district referred to had shipped to market about 33,000 crates of pines, and a considerable fraction of the crop then remained unharvested. While pineapple culture is quite expensive, especially the establishment of the orchard from the plants or suckers, it has paid remarkably well in many cases in Florida. An average of \$200 per acre, in some instances reaching as much as \$600, has been claimed for the fruit in the Indian river region and about Lake Worth. Most of the Florida pines, amounting to some 50,000 crates for the entire crop, are sent to the markets of the At-

lantic seaboard, although a portion of them is sent to the markets of the middle west. Recently a considerable consignment of this fruit was sent to the English market and sold by auction in Liverpool, at an average of 14 cents per pine. This particular shipment consisted almost wholly of small sized fruit, and the prices obtained were regarded as quite satisfactory, the freight charge being but about 1 cent each.

Growers along the Indian river have suffered some loss the present year from excessive drouth, which has generally reduced the size of the fruit, though it is alleged that the fruit has reached market in better condition than usual. Evidently the Florida pine growers should provide themselves with irrigating facilities, and thus become masters of the situation so far as needed moisture is concerned. There is an abundance of water near the surface in all that region, and to bring it to the surface and apply it to the pineapple plantations is but the work of a short time and the expenditure of a small sum.

Honesty in Fruit Packing.—It has been alleged that a good fruit grader, which can be purchased at a comparatively small cost, is a better promoter of honesty in fruit packing than a copy of the new testament. Be that as it may, a proper grading of fruit before packing for market is not only conducive to honesty, but helps the sale in almost every case. It must be confessed that buyers are nearly always suspicious that the fine looking fruit in plain view on the top of the package is not fairly representative of the entire contents. But it may be asked, what has aroused this suspicion and almost universal distrust of fruit packages exposed for sale in every market? Only one answer is possible. It is the too prevalent custom of putting fruits of various sizes and conditions in the packages and then facing them with choice specimens of uniform size and quality. This is certainly deception if not strictly dishonesty. The seller does not necessarily proclaim the uniformity of the package from top to bottom, to be sure, but the outside layer invites purchases which a fair representation of the contents could not attract. It is customary for farmers and fruit growers quite generally to condemn the habits of dealers, and certainly their condemnation is very often warranted. But the fruit grower or farmer who puts the best goods on the top of the package is equally open to criticism. As an aid, therefore, to honesty as well as to the best returns for farm products, they should be carefully graded before offering in the market. Every fruit grower should have a proper grader through which his fruit should be put before packing. While such grading must relate mainly to size, yet, when properly sized, hand-grading for quality may be done far more easily and cheaply. Thus every grower should sell his products in strict accordance with honest business methods; not only for the sake of the honesty of it, but also for the profit which is sure to follow. A grower adopting such practice and not pretending that his produce is all first grade, but selling it by its honest grade according to merit, will not only gain but deserve the confidence of the consuming public and will inevitably profit thereby. We are prone to denounce the "wheat gamblers" on the produce exchanges, and they sometimes deserve strictures, but the man who should sell goods habitually which are not "up to sample" in quality would not be allowed to do business in any exchange in this country. And this is right. The man who puts the

best berries or other fruits on top and demands a top price on that account should be passed by. Prices should be regulated by size and quality alone, and it should be made a criminal offense to offer fruit for sale whose visible parts grossly misrepresent the contents of the packages.

Trees on the Plains.—The treeless condition of the Great Plains country, between the Rocky Mountains and Missouri river, has been whimsically explained by some as due to the fine and peculiar texture of the soil, which is alleged to be unfavorable to tree growth. The fact that the islands in the Arkansas and other rivers of the region were found by the earliest settlers covered by a dense growth of trees, and that nooks along the banks which were protected from sweeping fires by high banks or "breaks" also held many fine trees, shows conclusively that the river bottoms at least would grow timber if protected from the ravages of fire. On the uplands, except in a few spots where water is held near the surface, trees cannot grow to any considerable size without irrigation, because there is not sufficient moisture to a large arboraceous growth; but where water is abundantly supplied, experience has shown that trees do remarkably well. The texture of the soil offers no impediment.

Growing Apricots is occupying a good deal of attention in the Pacific section. A. M. Cambridge, of Kern county, sold on the tree his this season's crop of apricots, from three-year-old trees, at prices which netted him about \$150.00 per acre. It is not claimed that very large orchards will do so well on the average, but that apricot culture will well repay care, attention and cultivation.

Profit from Peaches.—The Visalia Fruit and Land Company, of Fresno county, California, sold on the trees this season, peaches which brought them \$13,000. This was the crop from 4,800 three-year-old trees and 3,800 two-year-olds. The land upon which these peaches were grown was bought three years ago last spring at \$100 per acre.

Celery.—Experiments have demonstrated that celery is a crop which can be most successfully grown by irrigation. Not only is a fine growth and excellent quality of celery produced by plentiful and judicious irrigation, but the crop is almost wholly free from blight. The plants should be set so that the soil about them may be kept at all times thoroughly moist.

Felling Trees by Electricity.—Trees are felled by electricity in the great forests of Galicia. For cutting comparatively soft woods the tool is in the form of an auger, which is mounted on a carriage and is moved to and fro and revolved at the same time by a small electric motor. As the cut deepens, wedges are inserted to prevent the rift from closing, and when the tree is nearly cut through, an ax or handsaw is used to finish the work. In this way trees are felled very rapidly, and with but little labor.

California fruit growers shipped strawberries the past season north into Washington and Victoria and to the Eastern States, and it is proposed to enlarge upon this branch of industry hereafter.

PULSE OF THE IRRIGATION INDUSTRY.

PROMINENT DELEGATES AT THE NATIONAL IRRIGATION CONGRESS.

THE recent Convention at Denver surpassed all its predecessors in its representative character, the delegates being actual residents of the regions they represented, and a number of them were men especially fitted, by study and experience, to deal with the work of the Congress. Seventeen States and Territories in Western America, and a number of Eastern and Southern States, were represented at Denver; also Mexico and Canada. It is very significant, as showing the advancement of the irrigation idea, that the old-style farming States of the East should send their representatives to this Convention, and implies startling possibilities in the future of the agricultural population in those States.

Each succeeding Congress shows a rapidly increasing interest in the subject of irrigation, and brings forward in greater numbers men of enterprise and intelligence, who recognize in this question of scientific agriculture the solution of the problem of disposing of the surplus labor of cities, and providing homes and support for the many millions which time will add to our population.



SENATOR CAREY,
Of Wyoming, Author of the Carey Land Law.



JOHN HENRY SMITH,
Of Utah



JUDGE JAMES B. BELFORD,
Of Colorado.



EDWARD M. BOGGS,
Prof. of Engineering, University of Arizona.



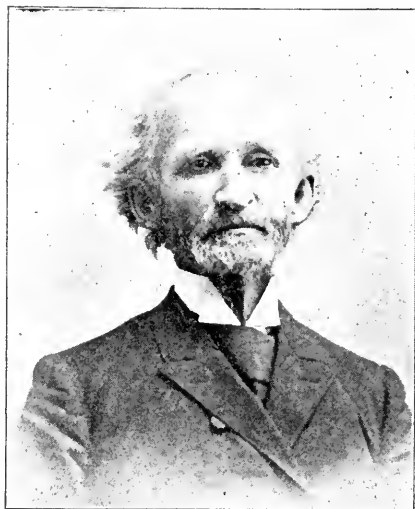
CLESSON S. KINNEY,
Of Utah, Author of Law of Water Rights and Appropriations.



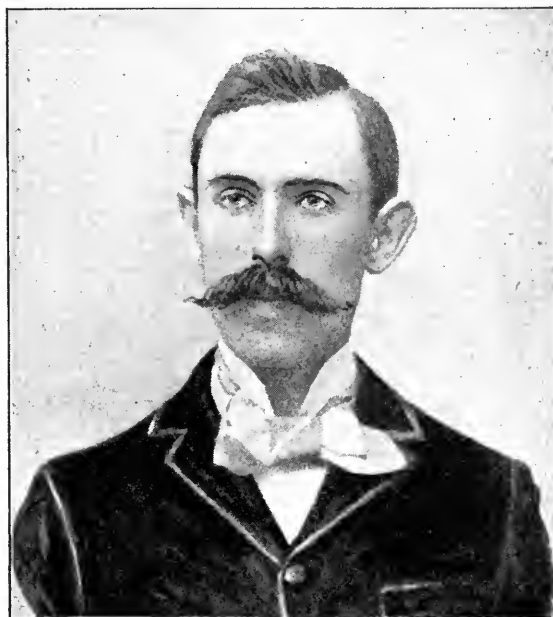
JUDGE JOHN H. PITZER,
Of Oklahoma.



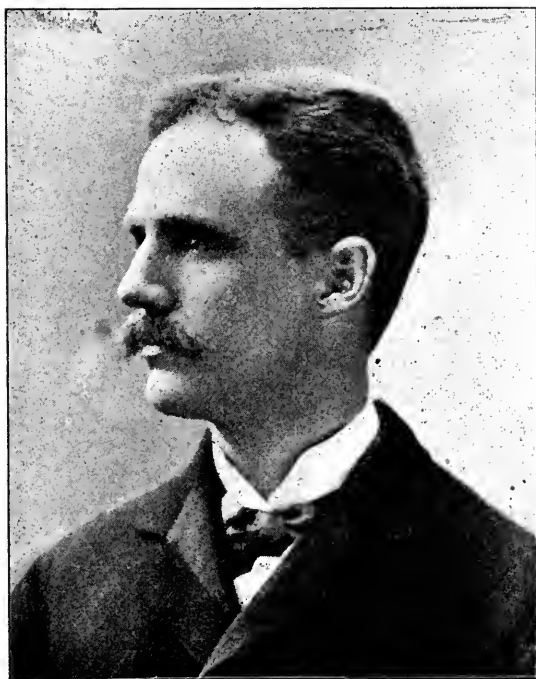
DAVID BOYD,
Of Greeley, Colorado.



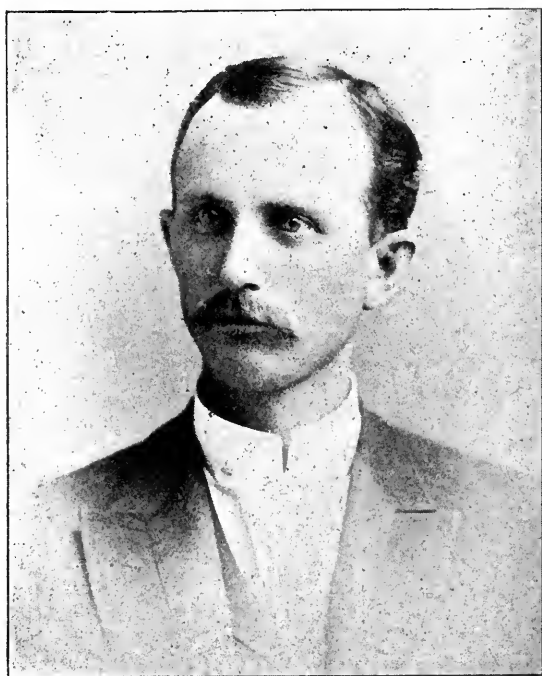
J. S. EMERY,
Of Kansas, National Lecturer on Irrigation.



J. B. LIPPINCOTT,
Engineer Antelope Valley Water Co., California.



R. B. HOWELL,
Of Nebraska.



JAY P. GRAVES,
Of Washington.

FRANCE AS AN OBJECT LESSON.

MOST Americans do not take kindly to citations of the exploits of the people of other countries, and are prone to believe that each and every member of this great Yankee nation is the superior of the unfortunate inhabitants of any other part of the world. Viewed from a purely patriotic standpoint, perhaps, this provincial estimate is pardonable, if not wholly just; but looked at from an economic point of view, it cannot command serious consideration. The fact is, we have much to learn from the people of other lands. Even the Chinese agriculturists can tell us how to preserve the fertility of the soil through thousands of years of constant production of good crops. Egyptians are still growing annual crops upon soil which was old in cultivation when the Pyramids were begun. England produces double the amount of wheat per acre that she did three hundred years ago, and the enormous productions of France have been for five centuries the marvel of agriculture.

France is smaller than Texas by the area of Oregon, and yet she produces nearly three-fourths as much wheat as the United States, twice as many prunes, fifty times as many olives, and twenty-five times as much wine. On her little area of 204,000 square miles, she feeds a population of forty millions and contributes largely to the support of other peoples in all parts of the world. The secret of it all is the small, well-tilled farm, supplemented by industry and frugality. French farmers do not burn their manure heaps or their straw, as is still done in some parts of the United States. The poultry raisers of France received more for their crop last year than American farmers received for their entire wheat crop, if we may depend upon statistics published in England, placing the poultry and eggs produced in France in 1893 at \$225,000,000. Very little land is allowed to remain unproductive in France. An ancient law, requiring holdings to be divided among the heirs of the owner, has resulted in doing there what Mr. Henry George and his school of economists expect to eventually accomplish in the United States by the single tax—that is, the subdivision of the land into small holdings, and virtually removing it from the field of speculation. Small farms, well tilled and properly fertilized, have made the French people as a mass exceedingly prosperous and financially independent. Nothing but the accumulated savings of the French farmers enabled the country to pay the enormous amount of blood money exacted by Germany at the end of the Franco-Prussian war. The French peasantry, having unquestioning faith in "*le Grand Homme*," Lesseps, and fired by a sublime enthusiasm for the glory of France, poured forth the hundreds of millions which that great engineer squandered so recklessly on the Panama isthmus. But we have the territory and every other needed facility to rebuild a greater France as well as a Greater Britain in the arid regions of the United

States. Water, small holdings, industry, economy and education only are needed to build up in time among the mountains and upon the so-called deserts of the sunset slope an empire greater in extent and higher in its civilization than even France can boast.

CHINESE IRRIGATORS IN THE EAST.

Over on Long Island, says the New York *World*, at a place called Steinway, you can find John Chinaman on his native heath.

Here you may see him in queer clothes and queer houses, raising queer products, and with a queer-looking pagoda-like summerhouse near by, to lend a real celestial air to his surroundings. It seems like a bit of China dropped into rural New York.

If you would learn how to husband the natural resources of the soil, go witness a Chinese farmer at work. He can give points to the most thrifty squatter that ever worked a Harlem field. Several fortunes have been made at Steinway, and their owners are now enjoying them in China.

John generally selects a tree near running water under which to build his house, and while the house is pretty sure to be dirty, the fields are the pink of neatness in all that pertains to good farming.

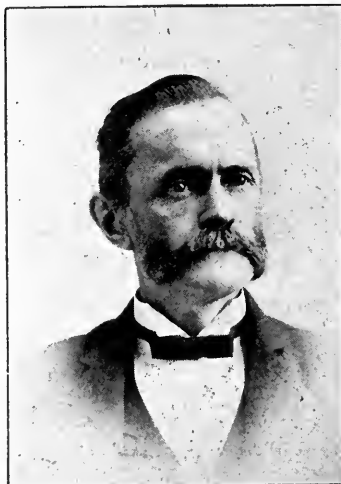
In the field he wears his native hat, uses primitive tools and generally does everything upside down. He never puts his phosphates in the ground; he just sprinkles them along the top of the hill. It is queer stuff, too, which looks like soot. He plants his vegetables upon a hill, with deep gullies on either side. He builds trellises and trains his vines upon them, and then when the fruit is ripe crawls underneath on his back and snips it off with a pair of shears.

But such fruit! No Jersey or Delaware horticulturist grows more toothsome products. His squashes, cucumbers, tomatoes and pumpkins have a reputation.

The rural Chinaman is a thorough believer in irrigation. The whole sub-soil of his farm is a network of water pipes. Every plot of ground has a water-barrel placed on one side and a pipe and faucet leading thereto. To show how queerly he works—after leading the water all under his fields to his water barrel, he laboriously lifts it out by the bucketful and throws it over the growing plants.

From daylight until dark he is at it, stopping only to eat, and after dark he still goes on, carrying his pailfuls of water over the fields. It would be perfectly useless for an agent to try to sell him such a labor-saving device as a garden-hose. He could not understand such a modern invention.

But after all he fills his niche. It is a profitable niche, of course, but he would not fill it if it wasn't. He is an autocrat in Chinatown and an example to the American market gardener. He disturbs no one and wants no one to disturb him. He toils and slaves, only in hope of the happiness and contentment and ease he will find when he returns to his native land.



WILLIAM REECE,
Superintendent City Schools,
Falls City, Nebraska.

ARIZONA.

It is proposed to spend \$250,000 in reclaiming Paradise valley.

The Gila Bend Reservoir & Irrigation Company and the Peoria Canal Co. have been sold by the receiver for \$900,000.

The Phoenix city council is considering a proposition to pipe irrigation water through the town instead of running it through in open ditches.

The interest in the Grand canyon dam is increasing. It is expected that within five years the waters of the mighty Colorado will be irrigating farms in the Wallapai valley.

There was rejoicing at Yuma over the passage of the bill by Congress dividing and allotting the lands of the Indian reservation. The selling of the remainder to actual settlers will open up thousands of acres of good land in the valley.

Several sites for mills and dams have been claimed on the Salt river, both above and below Tempe. These locations are for mechanical power and manufacturing purposes.

A ranch of one hundred and sixty acres is irrigated from the Salt river by a six-inch centrifugal pump.

The water supply of the Colorado River is sufficient to irrigate several hundred thousand acres of land.

CALIFORNIA.

The Board of Directors of the Modesto Irrigation District are reported to have recently let a \$65,000 contract for the construction of head gates, flumes and waste gates on the Modesto canal.

Successful results have followed the boring of artesian wells in and about Santa Barbara, and the people seem to be awakening to the fact that there is an abundance of water within easy reach if they will only take the trouble to bore for it.

An artesian well 575 feet deep has been sunk by George W. Durborow at Indio, San Diego county, for the purpose of irrigating his fruit trees.

Mr. Cogswell, of Monrovia, Los Angeles county, has lately put a pump into a well 130 feet deep, driven by a twelve-horse-power gasoline engine, and secures sufficient water to irrigate 450 acres of land.

The South Riverside Water Co. has an engineer making an estimate of the cost of drawing water from Elsinore lake.

Kern county has an artesian well which delivers 4,000,000 gallons of water daily.

Work on the Escondido irrigation system is progressing satisfactorily. The new dam is now well under way and the work will be pushed as rapidly as possible.

Richard Egan and a number of surveyors recently left Los Angeles to measure the water in Santiago creek.

COLORADO.

The survey of the new line of the Fort Morgan canal has been completed.

Observations are being taken on a quantity of seepage water that is finding its way back from the canyon to the Platte in Wells county.

The Montrose *Enterprise* is trying to push the matter of taking the Gunnison river into the Uncompahgre valley. If this object is accomplished nearly all the land in the valley can be irrigated.

IDAHO.

An attempt is being made to develop artesian water in the Snake River valley. Work on the Orchard Farm dam has been commenced.

George W. Newell has three artesian wells on his farm in the Snake River valley and expects to sink enough more to irrigate his entire 640 acres. The water from the wells is hot.

A survey is being made on the projected canal of the Farmers' Union ditch, which is to be taken out of the Boise river above Star.

KANSAS.

Garden City has been inspected during the last month by many excursion parties. The system of windmill irrigation has been the object of interest.

The Galloway cattle ranch, comprising about 12,000 acres of land in Edwards county, has been sold to Cincinnati capitalists. They expect to divide it into small farms and colonize it with Ohio farmers. Each twenty acres or so will be irrigated with a pump.

Haskell county held an irrigation meeting late in August, which was very largely attended.

E. J. Nason makes several pertinent irrigation suggestions to the *Washington Register*, and closes them with: "It is certainly a question of vital importance, and any action upon it would be of benefit to all."

Hon. C. B. Hoffman recently purchased 240 acres of land lying in the Smoky Hill bottoms adjoining Enterprise, which will be placed under irrigation and divided into ten or twenty acre tracts, to be leased to men of families.

Editor Cowgill, of the *Kansas Farmer*, proposes to try the pump plan of irrigation.

An irrigation pumping plant in Geary county, central Kansas, was recently started by H. Morris and W. Harlacker on Lyons creek, four miles south of Junction City. Sixty acres will be irrigated.

An enthusiastic irrigation meeting was lately held in Great Bend, Barton county.

There will be a great display of products raised by irrigation at the County Fair of Finney county, which begins October 4th.

A farmer near Garden City tried winter irrigation with very good results, having cut two crops of alfalfa and securing a large crop of seed from his forty-acre farm.

The *Lincoln Journal* says: "Irrigation by means of wind has progressed much beyond the experimental stage at Garden City, Kas. The effect can be seen to be marvelous, even from the car windows as one travels across the district."

Kansas is rapidly realizing the value of irrigation, and work on pumping plants and other systems of irrigating is progressing as rapidly as possible. Next year will see a very large number of farms in the central and eastern portions irrigated; if not entirely, at least a few acres will be experimented with.

William Reece, Superintendent of the Falls City Public Schools, is a native of New Baltimore, Ohio. From June, 1885, to September, 1886, he traveled over

western Texas and Kansas as geologist and surveyor for Ohio and Chicago land companies. Professor Reece has given much attention to agriculture and spent part of his recent vacation in western Kansas, examining irrigating wells and ditches and in investigating the profits of raising alfalfa in western Kansas and Nebraska.

NEBRASKA.

Western Nebraska has been thoroughly aroused the past season to the importance and value of irrigation. The local papers have teemed with discussions upon the subject, reports of ditches projected and under construction, and advice to the people who had not the means of irrigation supply to secure the same without delay. It will be well for that State if this feeling continues with unabated or increasing ardor, unchecked by the occurrence of occasional copious rains. Western Nebraska irrigated will be a rich, populous, prosperous region. Without irrigation it will continually tempt immigrants, only to disappoint them and waste their time and money.

Lexington precinct, in Dawson county, recently voted to issue \$10,000 worth of bonds to aid and encourage a stock company to build a canal which will irrigate 30,000 acres of land in the valley.

A civil engineer recently made a trip over the country and to the South Loup river, and reported favorably to the irrigation committee as to the feasibility of irrigating the land surrounding Grand Island.

At a late meeting of the Madison County Alliance the whole irrigation subject was fully discussed, and it was shown that that vicinity could be cheaply irrigated and that it would pay to do so.

An enthusiastic meeting was lately held at Gibbon to consider a proposition from the Kearney Canal Co. to supply the farmers in the township with water.

At a recent meeting of the City Council of Shelton, Engineer O'Brien submitted a map showing how the two lower tiers of townships of Buffalo county could be irrigated from the Kearney canal.

A survey is being made for the Loup City and Rockville Irrigation ditch. The Middle Loup river will be tapped below Arcadia.

Governor Crounse, early in September, refused to call an extra session of the legislature to aid the drouth sufferers.

The farmers and business men of Adams county are discussing the building of an irrigation ditch.

Chadron hopes to be able to secure the location of a big sugar factory there.

The farmers along the line of the Meeker irrigation ditch, near Culbertson, all report good crops.

Farmers in the Lodge Pole valley are taking steps to show the feasibility of irrigating.

The Grand Island *Independent* places the loss of their county at \$500,000, owing to their not having irrigated this year.

York county is agitating a scheme to tap the Platte river.

President I. A. Fort says that Lincoln county will have hundreds of acres under irrigation next year.

Perkins county has voted \$90,000 in bonds for irrigation purposes.

On the highlands of Cherry county are a number of

lakes capable of holding enough water to irrigate 500 acres.

A conservative estimate places the cash value of the crop of potatoes raised by irrigation by Henry Lehman, near Culbertson, on twenty-five acres, at \$3,000.

The Sherman County Irrigation Water Power and Improvement Co. has elected permanent officers for the ensuing year as follows: Directors, A. P. Culley, R. J. Nightingale, Aaron Wall, J. Phil. Jarger and Carsten Truelson, who selected the following officials: C. L. Drake, president; Charles Riedel, vice-president; W. R. Miller, secretary; and R. J. Nightingale, treasurer. The proposed canal will be sixty feet wide and about thirty-five miles long. It will draw its supply of water from Middle Loup river.

The absorbing question in Nebraska is, "Are you going to irrigate?"

NEW MEXICO.

The Municipal Investment Co., of Chicago, is building an irrigation ditch, which commences at Santa Cruz canyon and follows the Rio Grande river to Albuquerque, a distance of about eighty miles. The estimated cost is \$600,000, and it is expected to irrigate over 100,000 acres.

New Mexico and Arizona are rapidly being converted into very profitable agricultural regions.

A new railroad is being built from Eddy, in the Pecos valley, to Albuquerque. On the southeast it connects with the Texas & Pacific system.

There is good clay for the manufacture of tile in the vicinity of Eddy.

The building of the railroad between Eddy and Roswell, in the Pecos valley, is progressing rapidly.

SOUTH DAKOTA.

The artesian wells of the great Dakota basin, the greatest artesian area in the world, are building up an enduring irrigation sentiment in that portion of the country by adding many dollars to the incomes of the lucky fellows who have such a water supply to aid in crop growing. The "township law" of South Dakota, under which townships may vote bonds for sinking a township well, has not proven satisfactory. When it comes to the matter of locating the well, every man in the bonded area wants the well on his land. There are, however, a large number of the wells in active and beneficial use.

Edgemont, South Dakota, is combining with a development of the smelting industry the advantages of grazing, dry farming and irrigation. The enterprising people of that locality will find that the irrigation interest, studiously and industriously developed, will excel, in the way of cash returns, all the other resources combined.

Charles Mix county proposes to sink eleven artesian wells.

A number of farmers living in the Cheyenne valley in Fall River county have decided to put in an irrigating wheel to take water from the Cheyenne river above the falls. They expect to build a ditch five miles long, which will irrigate a great number of acres.

A. C. Bartholomew, of the South Dakota Agricultural College, recently made some interesting irrigation experiments in Brulé county. He states that

waste water from an artesian well in Brule county had formed lakes ten feet deep and covered four hundred acres of land. This would be sufficient to irrigate above four thousand acres. The farmers are afraid to use the water from the well for irrigation, owing to the wording of the present artesian well law. To remedy this he suggests that the law be so amended that every farmer whose land can be reached can use the water to produce crops.

A meeting of the South Dakota Irrigation Association was held at Huron recently, at which the proposal to borrow the school fund of the State for irrigating purposes was considered.

Lyman county expects to have some artesian wells sunk on the Sioux reservation for irrigation purposes.

The Valley Land and Irrigation Co., of Huron, recently closed a deal for fifty quarter sections in Edmunds county.

The Legislative Committee of the State Irrigation Association recently visited the farm of T. A. White, three miles north of Huron, where they found an excellent object lesson of the benefits of irrigation on a forty-acre tract, irrigated by a three-inch well.

TEXAS.

There is a prospect of Concho valley being irrigated.

The contract for the irrigation of 40,000 acres of land in the San José valley was recently filed with the county clerk. According to the plans, there will be 130 miles of canals.

In various portions of the State investigations are being made as to the flow of water from the artesian wells, and the possibility of largely increasing the supply and using it for irrigation purposes.

UTAH.

W. H. Rowe has a number of teams breaking up land near Corinne and clearing it. The intention is to seed about 5,000 acres.

It is proposed to build a reservoir in the mountains and tunnel through into the Manti City creek. If the project is feasible and is carried out, it will be a very good investment.

The Bear Lake and River Water Works and Irrigation Company's properties have been sold for \$500,000. A new company has been organized to complete the building of the canal.

The Manti *Messenger* says the first duty of Utah as a State will be to reclaim some of the arid land and assist the people to build homes.

WASHINGTON.

Yakima valley is rapidly becoming known as one of the best agricultural regions in the country. The crops raised this year by irrigation are some of the largest known.

Senator Ide is interested in a proposed canal sixty miles long, in the Yakima valley.

The building of the middle Kittitas irrigation canal is progressing rapidly. This canal will be of very great importance, and will irrigate a great amount of land now scarcely touched.

The Wenatchee country is attempting to reorganize the old irrigation district, and, should it succeed in doing so, a canal will be built.

The Kennewick cooperative irrigation district has 13,000 acres under ditch.

North Yakima has another irrigation company, which expects to irrigate about 3,000 acres, none of which will be more than four miles from the city.

EAST OF THE MISSOURI.

The subject of irrigation for the rich and productive land in the vicinity of Toledo, Ohio, is being discussed very freely. The gardeners and fruit-growers are beginning to realize the immense advantages of irrigation.

George Graves, a farmer near Merrimac, Wisconsin, has made quite a sum of money by utilizing the water from a little creek to irrigate an acre and one-half of potatoes.

Three large drive wells were lately sunk on the Wisconsin shore, opposite Eagle Point, by the Dubuque Fruit & Produce Co., from which water was obtained to irrigate fifteen acres of cabbages, five acres of tomatoes and a number of other vegetables.

The farmers on Muscatine Island, Iowa, have driven wells in groups and intend to use the water next year to irrigate their melon and sweet potato crops.

Williams Bros., of Douglas, Michigan, were somewhat delayed in getting their irrigation plant installed, and did not begin pumping until about August 1, which prevented their realizing the full benefit of irrigation this season. But the results of the experiment were satisfactory. They use a No. 3 centrifugal pump, operated by a ten-horse power traction engine, the capacity of the pump being 650 gallons per minute. Next spring they intend to draw a supply from the Kalamazoo river, and will utilize the water to irrigate sixty acres of fruit orchard.

An experiment in irrigation has been conducted by H. E. Bucklen on a twenty-acre farm near Elkhart, Indiana. The water was obtained from a well, the pump being operated by a windmill, and the results have been very satisfactory.

Mr. Orrville T. Chamberlain, of Elkhart, a gentleman owning a large quantity of land in that vicinity, intends to adopt irrigation next year.

Judging from the interest now taken in the subject, irrigation legislation will command a large share of attention in many State legislatures within the next twelve months, which have heretofore given but little attention to the subject.

Nevada has sixty-five or seventy artesian wells.

The farmers of Umatilla county, Oregon, are considering the raising of sugar beets.

FOREIGN.

In view of the proposed large irrigation works in the Nile valley, the execution of which threatens some of the most ancient and venerable relics of Egypt, a memorial has been forwarded to Nuba Pasha, by the Society for the Preservation of the Monuments of Ancient Egypt, to prevent, if possible, any such consequences accruing. The memorialists observe that the monuments of Egypt are in the interest of the whole world.

Artesian wells are causing great changes in the agricultural prospects of Queensland and New South Wales, Australia. Large tracts of land have become valuable since the hidden reservoirs of water were tapped.

The Western Society of Engineers has undertaken to make its library the nucleus of a central technical library of reference of all divisions of engineering and allied subjects.

Recognizing the importance, both present and prospective, of the irrigation interests of this country, it is desired to make the literature of irrigation a special feature of this library, the library to be accessible under liberal rules to persons seeking technical information.

To this end the society invites contributions to its library of books and other publications, maps, drawings, photographs, etc., pertaining to irrigation and irrigation interests in all parts of the world.

It is hoped this invitation will be generously responded to, and a valuable library on irrigation and kindred subjects be built up in this city. Address the Librarian, Charles J. Roney, 51 Lakeside building, Chicago.

RECENT LEGAL DECISIONS.

Assignment for the Benefit of Creditors.—The assignment law was not intended to affect or touch the general right of a debtor to prefer creditors, but was destined for cases where the debtor professedly did not desire or intend to make preferences, but desired to convey it all to a trustee for a ratable payment to all, a simple and convenient means to effectuate such purpose is thus provided. It then provides that a debtor so professing to turn over all his property for the benefit, proportionately, of all his creditors, cannot use such assignment to accomplish an inconsistent purpose. He cannot professedly use the law and the assignment for one purpose, but actually use for it another; not because he has no right to prefer particular creditors, but because to do so under such circumstances would be a fraud upon the law. He may make a general assignment or not, as he chooses, but if he uses the law at all he must do it in good faith, and conform to its terms and requirements. He must "use as not abusing" it. Of course it is not indispensable that in making such assignment the debtor use the very terms of the statute, but it is indispensable that his acts be such as to indicate his intention to take advantage of, and put himself and his property under protection of, the statute permitting and regulating a general assignment by a debtor for the benefit of his creditors; and any judicial construction which, against the debtor's will and design, forces his property within the range of the general assignment law, and compels its disposition thereunder, would reverse the policy of the law, and make the assignment an involuntary instead of a voluntary one.

Sandwich Manfg Co. v. Max. (Supreme Court of South Dakota.) 58 N. W. Rep. 14.

Creation of Easement by Flowage of Water.—When a lot owner constructs a ditch, by which water, which before has run upon and over his land, is conducted to a pond in the rear part of the lot, in order to relieve the front part of the lot from the flow of water, he creates an easement in favor of the front part of the lot and imposes a servitude on the rear part; and on the purchase of the rear and front parts by different persons, with notice of such easement and servitude, the grantee of the rear part cannot obstruct the ditch so as back the water upon the front part.

Sharpe v. Scheible. (Supreme Court of Pennsylvania.) 29 At. Rep. 736.

The Supreme Court of Oregon holds that a prior appropriator of water for irrigation purposes abandons his right to increase the appropriation by failing for thirteen years to increase the area cultivated, during which time subsequent rights have accrued. The right of appropriation depends upon the application of the water to the intended use, and not upon the capacity of the irrigating ditch. An appropriation of the waters of a stream to a beneficial use is an appropriation of its tributaries.

Low v. Rizer. 37 Pac. Rep. 82.

Liabilities of Express Companies.—The agent of an express company induced a bank by fraud to send money to a fictitious firm in another city, and the express company received and accepted for the money, and shipped it to such city where the

agent embezzled it. The money sent was constructively in the hands of the express company, and could be recovered from it by the bank.

Southern Express Company v. Jasper Trust Company. (Supreme Court of Alabama.) 14 So. Rep. 546.

Implied Covenants of Title.—Where one leased lands on which were springs, the water from which flowed on the land W., who had the sole title to the water by original appropriation for irrigation. It was held that the general covenant of title implied by the words "lease and demise," used in the lease, was limited by a covenant that the lessee should quietly keep the premises "without hindrance or molestation from the said lessor, or anybody claiming by, or through, or under it," and that he could not recover for the loss of the use of the water, as W. did not claim by, through, or under it.

Groomer v. Ogden City. (Supreme Court of Utah.) 37 Pac. Rep. 90.

Trover Against Landlord by Tenant.—Where, during the term of a lease, the landlord enters and takes possession of the premises, and converts to his own use removable trade fixtures erected by the tenant for his business, the tenant may bring trover against the landlord, unless he has surrendered the premises and abandoned the term.

Rosenau v. Syring. (Supreme Court of Oregon.) 35 Pac. Rep. 844.

Validity of Assignment of Pledge.—An assignment of his interest in a mortgage and notes pledged as security for a loan by the executor of the pledgee is valid, and not a fraud upon the pledgor, though payment is not first demanded of the pledgor, nor notice given him that such assignment is to be made, as it does not affect his position or right to redeem.

Drake v. Cloonan. (Supreme Court of Michigan.) 57 N. W. Rep. 1098.

Liability of Common Carriers.—A bona fide purchaser of a false bill of lading from the person to whom it was issued by the railroad company, may hold the company liable to the extent of advances made upon it, under the statute which provides that any carrier which issues a bill of lading as if property had been received, shall be liable to any person injured thereby.

Jaspar Trust Co. v. Kansas City, M. & B. R. Co. (Supreme Court of Alabama.) 14 So. Rep. 546.

Validity of Deed of Trust.—The statute providing that every assignment by a debtor in trust for his creditors, shall be for the benefit of all the creditors, and that provisions for preferential payments shall be void, and all debts (including judgments by confession thirty days previous to such assignment) shall be paid *pro rata* from the assets thereof, does not prevent an insolvent debtor from pledging property for the security of part of his creditors only. The fact that a chattel deed of trust, made to secure notes to part only of the grantor's creditors, empowers the trustee to take possession of the property and sell it at a private sale, and hold the proceeds until the maturity of all the notes secured, does not make it a general assignment.

Jaffray v. Matthews. (Supreme Court of Missouri.) 25 S. W. Rep. 187.

When a Levy is Invalid.—Where an officer, in whose hands an attachment is placed, does not seize the property sought to be attached, nor assume possession or control thereof, but merely makes a verbal agreement with the attachment debtor, that the attaching creditor shall take charge of it as receptor, and there is no apparent change of possession, the levy is invalid as against a subsequent levy of another attachment on the same property.

Mahon v. Kennedy. (Supreme Court of Wisconsin.) 57 N. W. Rep. 1108.

AN IMPORTANT DECISION.

The Supreme Court of California has given an important irrigation district ruling in the case of *Quint v. Graham*, involving actions of directors of the Central Irrigation District in making an assessment levy during 1892. In passing on the matter the Court says:

"This Board of Directors is a creature of the statute, and it can do nothing unless authorized by the statute. It exceeded its power in making this levy. The statute says it had the power and it was its duty to levy an assessment sufficient to pay the annual interest. But here it exceeded its power by levying an assessment largely in excess of that amount. By this section of the act certain burdens could only be cast upon the land of the tax-payers of the district, and they had they double right to insist upon a rigid compliance within this proviso of the statute. The Board has no right to assume that the tax upon any particular tract of land will not be paid either by the owner or by a sale of the land itself. The question of the amount to be raised is not one of discretion, but of pure legal right. It cannot be held that a judicial discretion is vested in the Board of Directors to fix the levy at any rate which it might deem sufficient to raise the amount necessary to pay the annual interest."

NEW COMPANIES.

Arizona.—*Phoenix.*—Castle Dome Canal Co., reported as having filed articles of incorporation.

California.—*Los Angeles.*—Lamanda Park Water Co., incorporated by M. L. Rafferty, H. F. Newell, William B. Carey, John W. Lohr and S. P. Demett. Capital stock \$75,000; \$2,500 actually subscribed.

Los Angeles.—Grand Junction Reservoir Co., incorporated. Capital stock, \$300,000.

Oakland.—The Leader Windmill Co., incorporated by W. L. B. Cushing, J. C. Bulster, W. G. H. Rulling, J. C. Baker and G. W. Bultner. Capital stock, \$10,000.

Pasadena.—North Pasadena Land & Water Co., reported trust deed for \$50,000.

Poso.—Poso Creek Water Development Co., incorporated. Capital stock, \$5,000. Operating water works.

Colorado.—*Pueblo.*—The Bessemer Irrigation Ditch Company will receive bids until September 20 concerning the cleaning of the Bessemer ditch, from the headgate to the west line of section 8, township 21, range 64 west, Pueblo county, or any part thereof. The probable amount of material required to be removed from the ditch in cleaning the same being from 30,000 to 50,000 cubic yards, and bids to be for the removal of such material at a stated rate per cubic yard, the material so removed to be placed in such manner as to strengthen the banks of the ditch. The work to be commenced not later than October 5, and to be completed within twenty-five days from commencing the same.

Denver.—The Pecos Valley Orchard Co., incorporated by Thomas I. Edsall, James G. Hagerman and Arthur S. Goetz, with a capital stock of \$200,000.

Denver.—The Battlement Mesa Ditch and Reservoir Company, incorporated by George Fogg, Thomas Miner, W. H. Stewart, Henry Pontier and Arthur King. Capital stock, \$6,000. The company will operate in Delta county.

Denver.—The Colorado Land and Immigration Co., incorporated. Capital stock, \$100,000.

Articles of incorporation of the Lincoln and Dawson County Irrigation Company, capitalized at \$500,000, are ready to file, and it is the intention of the company to build an irrigation ditch through the eastern part of Lincoln county and extend it about fifteen miles into Dawson county.

Florida.—*Rockledge.*—The Rockledge Beach Canal Co., incorporated with a capital stock of \$20,000.

Idaho.—*Boise City.*—The Farmers' Union Ditch Co., incorporated by S. S. Foote, Phillip S. Palmer, James G. Camp and W. J. Flake. Capital stock, \$50,000, of which \$18,450 is subscribed.

Nebraska.—*Lexington.*—Farmers' Irrigation Co., incorporated. Capital stock, \$6,000.

Lexington.—Farmers and Merchants Irrigation Co., incorporated. Capital stock, \$25,000.

Lincoln.—The South Side Irrigating Canal Co., incorporated by H. M. Knoll, W. E. Young, C. C. Campbell, John D. Anderson, E. M. Young, George Dale and J. N. France. Capital stock, \$150,000. Water will be taken from the Platte river, the ditch beginning on the south side of the river, in section 30, township 12, range 26 west from Lincoln county, and end near the east line of Rigold precinct in Dawson county.

Lincoln.—The Elkhorn Irrigation Company, of Holt county, lately filed articles of incorporation, indicating that business is to be commenced at once and with much vigor.

Lincoln.—Articles of incorporation of the Burwell Irrigation Company were filed in the office of the Garfield county clerk. The new corporation is composed of twelve representative farmers. The capital stock is \$50,000, and shares \$100. It is proposed to dig a ditch about twenty miles long, and to aid in this the precinct in which Burwell is situated will be asked to vote bonds. Owing to the fact that the crop was a partial failure here last year, and for one or two years preceding that, many people will be entirely destitute in a very short time, and outside aid alone can stand between them and suffering.

Lillian.—The Lillian Irrigation & Power Co. is the name of a new company just organized at Lillian. The incorporators and officers are: David McGugin, president; R. H. Sargent, vice-president; W. H. Russell, secretary; J. E. Ash, treasurer; L. H. Jewett, H. P. Gates, A. Wallace, Frank Doty, James Darc, Plin Metcalf, A. J. Ricketts, A. Kellogg and G. W. Dewey. The capital stock is fixed at \$10,000.

O'Neill.—Elkhorn Irrigation Co., incorporated. Capital stock, \$25,000.

North Platte.—Farmers & Merchants Irrigation Co., incorporated. Capital stock, \$50,000.

Wescott.—The Wescott Irrigation & Canal Co. has effected an organization. The company is composed of farmers and others owning land under the proposed ditch and for the construction of which this company is organized. Water will be taken out of the river just below the Sargent bridge and will be turned back into the river through Spring creek about four miles east of Wescott. The present officers are: Peter Mickel, president; DeWitt Comstock, secretary, and Elias Cleaveland, treasurer. Construction work will commence as soon as the permanent survey can be made and the necessary scrapers, etc., arrive.

Kansas.—*Wallace.*—The Wallace County Irrigation and Agricultural Association, incorporated.

Missouri.—*Springfield.*—The Southwest Missouri Immigration and Improvement Co., incorporated by G. A. Ramsey, H. F. Fellows, Benjamin U. Massey, L. B. Richardson, J. C. McManima, J. N. Mallett and Charles A. McCann. Capital stock, \$2,000.

Oregon.—*Cascade Locks.*—The Cascade Water Co., incorporated by D. L. Oates, H. A. Levins, T. C. Benson, E. P. Ash and G. Hickok. Capital stock, \$1,500. The principal object is to construct and operate water works in that city.

New Bridge. Union county.—The Dry Gulch Ditch and Irrigation Co., limited, incorporated by A. L. Stalker, H. J. Fuller, R. H. Boyles, C. Leep, J. W. Koger, Mary Koger, W. E. Wood, Ira Sacridier and G. N. Reed. The capital stock is fixed at \$4,000, divided into 2,000 shares. The purpose is to construct a ditch to carry a portion of the water of Eagle creeks upon a portion of the arid lands of that section of the State for the purpose of irrigation. The ditch, when completed, is to carry 4,000 inches of water at the headgate.

Pendleton. Umatilla county.—The Maxwell Irrigation Co., incorporated by Jas. A. Creswell and William Ogg. Capital stock, \$5,000.

Salem.—Oregon Wholesale Co., limited, incorporated by William Wirt, of Denver, and Archie McGill and Malcolm McDonald, of Salem. Capital stock, \$20,000. To construct and operate canals, ditches and pipe lines for conducting water, to operate water powers and to maintain water rights and privileges.

Texas.—*Menardville.*—The Clark Creek Irrigation & Manufacturing Co. of Menard county has been chartered by W. L. Black, George L. and Louis H. Rang. The capital stock is \$10,000.

Beaumont.—An artesian well is to be sunk. Gus. Warnecke and H. B. Johnson, of Houston, Tex., are interested.

Brownwood.—Low & Low will put in an irrigation plant, and want machinery to irrigate 200 acres of land with nine inches of water in fifteen days time. It is desired to elevate this water twenty-five feet and then carry it 400 yards. Plans and prices for the works are desired.

Laredo.—Mr. S. F. Kerr, of San Antonio, it is stated, has leased a pumping plant of the North Laredo Land & Irrigation Company and will put in a pump with a capacity of 2,500 gallons per minute.

San Antonio.—A company has been organized with a capital stock of \$150,000 for the purpose of constructing a canal from San Antonio to the Medina river. Z. O. Stocker, of San Antonio, and J. S. Taylor, of California, are the organizers. The canal is to be for irrigating purposes, and is expected to water about 20,000 acres of land; route has been surveyed and map filed for record.

Seguin.—Mr. T. L. Johnson has organized a stock company with a capital stock of \$1,000,000 for the purpose of constructing canals for irrigating lands in southern Texas.

Utah.—*Ogden.*—The Bear Lake Irrigation & Ogden Water Works has been incorporated.

Washington.—*Kent.*—White River Land Co., reported incorporated.

Canada.—*Calgary.*—The Sheep Creek Irrigation Company, (Limited), with a capital stock of \$1,000, is applying for incorporation in order to sink wells, construct dams, cribs, embankments, etc.

FRUIT EXCHANGES.

California.—*Los Angeles.*—The Tuluca Fruit Growers' Association, incorporated by R. E. Smith, W. H. Andrews, E. B. Lindesmith, A. M. Jones, W. C. Wedington, Arthur Gayford and I. W. Deupree, with a capital stock of \$40,000, of which \$1,380 is actually subscribed.

Santa Cruz.—The Santa Cruz County Fruit Growers' Union, incorporated by S. R. Wallace, H. R. Dakin, of Soquel, and A. G. Rose, P. T. Stribling, F. A. Hihn, W. H. Galbraith and S. F. Grover, of Santa Cruz. Capital stock, \$40,000.

Tuluca.—The Tuluca Fruit Growers' Association, incorporated. Capital stock, \$40,000.

Iowa.—*Sioux City.*—The Iowa and Florida Fruit Co., incorporated by W. M. Mullenbaux, T. C. Prescott, G. A. Preston, J. W. Hallam and W. S. Preston. Capital stock, \$25,000. Will commence business when \$1,000 has been paid in. The organization was formed for the purpose of buying and selling farm lands, particularly in the State of Florida, and of raising fruit on its own account.

Washington.—*North Yakima.*—Articles of incorporation for the Yakima Fruit Company have been filed in the auditor's office. The capital stock of the company is \$2,000, and the incorporators are, A. B. Weed, George C. Mitchell, W. H. Redman, E. R. Leaming, Frank Bartholet and Fred Parker. Shares are of the value of \$100 each. The objects of the corporation are: "To purchase, take, own and operate all necessary apparatus for curing, drying, evaporating and preparing for market fruits, berries and other agricultural products, and to sell and dispose of the same; to buy, sell and exchange fresh and dried fruits and other agricultural products, and to deal therein generally," etc.

PUBLISHER'S DEPARTMENT.

CHARACTER IN COMMUNITIES.

THE INFLUENCE OF THE EARLY SETTLER IN SHAPING THE INSTITUTIONS OF NEW COUNTRIES.

EVERY student of colonial development has noted the deep and lasting influence wrought on the character of new countries by the early settlers. The rigid moral temper of the Puritan is still felt in the communities which have grown up around the shores of Massachusetts Bay. The liberal spirit of Roger Williams dominates the public sentiment of Rhode Island down to the present hour. The easy going, generous habits and methods of the cavalier yet remain prominent traits of the true Virginian character. And so the parallel between the first colonist and the present population may readily be traced through each of the thirteen original States that fringe the Atlantic Ocean.

MODERN CIVILIZATION.

The same principle may be observed in the more recent colonization of the Arid West. The first settlers in the valley of the great Salt Lake formed the institutions of Utah. Greeley, Colo., still exhibits the impress of its pioneers. Places might be mentioned in California, where the climate, soil and all physical conditions were exactly equal, and yet where two communities differing widely in all that goes to make the character of a town have grown up side by side. The difference in results can be explained only by the difference in the kind of people who first settled in each locality. A hundred valleys of Arid America are in process of settlement to-day. Ascertain what kind of people are going into these valleys at the beginning of their development and you can predict with great confidence the future of their institutions.

THE PRINCIPLE RECOGNIZED IN BUSINESS.

The influence of early settlers in molding the character of communities, as has been said, has long been recognized by students of such matters, but it is only very recently that it has been taken into account as a principle that ought to govern the sale of land. This has been done by the Kern County Land Company of California. The effort of this company is not only to sell land, but to sell land to people

who will give value to the property by the spirit and method with which they work. To this end the company has put into use a document known as an "Application for the Purchase of Land." It resembles somewhat an application for life insurance in form and appearance. In filling out this blank the applicant states for what purpose the land is desired, the present occupation of the party who will use it, the size of the family and a list of references. The applicant then describes the location of the land which he desires to purchase, and then gives in detail the statements and inducements which have led him to make application for the purchase. Then follows a copy of the agreement and deed under which title to the land will be conveyed, and the applicant is required to read these carefully and state that he fully understands them.

FROM THE SETTLER'S STANDPOINT.

Let the application blank be studied for a moment from the standpoint of the settler. It is a serious business for any family to change its home by moving several hundred or one or two thousand miles to a new country. It is a matter to be debated in all its aspects at the fireside. It involves the sundering of old ties and associations, and very frequently the abandonment of employments in which men have earned their living. To leave an old home in one state or country and seek a new one in another, which is known to the intending settler probably only as a matter of reading or hearsay, is one of the most momentous affairs of life. And it will be either a great success or a disheartening failure, according as the step is taken wisely or foolishly.

Men are urged every day to put aside the old home as readily as they would put off an old suit of clothes; but no man who has a proper appreciation of what it means to a family to invest its all in a new country will urge that this be done without the most careful consideration. Now, the Kern County Land Company desires to know not only who



AN IRRIGATING CANAL.

the intending purchaser is and what people say of his character as a man and citizen, but it wants him to state in writing for what purpose he desires the land and just what arguments and inducements were used in arousing his desire for it. Could the settler ask or receive stronger evidence of good faith on the part of the company with which he is dealing? If the company merely desired to sell land it would ask but one question: Can this man pay for it? But the company desires more. It insists that the purchaser shall obtain land suited to his purpose, that it shall be fully equal to the representations made to him, that it shall know in advance that the man and the land are suited to each other and that there is a good chance for the new home to be blessed with prosperity. This is the matter from a standpoint of the intending settler. Much more could be said under this head, but a careful study of the application blank itself will quickly disclose its advantages to the settler.

FROM THE COMPANY'S STANDPOINT.

The use of the application blank has created something of a sensation in certain circles. It is not exactly in line with the usual real estate methods. Land has been sold in the past quite generally by any means that would sell it. The climate, soil and productions have been made to conform beautifully to the hopes and wishes of the prospective customer. No one has thought of asking anybody to file a formal application for the privilege of buying a small irrigated farm, any more than they would think of asking such a thing of the purchaser of a town lot in an outlying addition. But let us consider this matter from a business standpoint, claiming nothing for the superior honesty and integrity of the method.

The Kern County Land Company represents an investment of considerably more than \$10,000,000 in land and water. To realize a reasonable return upon this great outlay it must find settlers for about 350,000 acres, in small tracts. To develop the utmost possibilities of the property will be a work not simply of years, but of decades. Supposing 50,000 acres were sold during the coming season by any sort of representation that would arouse a great temporary demand. Then suppose half of the people who purchased it should prove to be totally unfitted, by taste and experience, for the work of home-making on a California farm. Suppose the other half discovered that the soil and climate were not well adapted to the particular forms of industry in which they had desired to engage. The Kern County Land Company would have settled 50,000 acres with discontented, disappointed men and deluded people. Whatever the moral obligation might be, the business blunder would be well nigh fatal. It would be a colossal mistake in the development of a great property. The application blank was devised as a means of protection against that blunder—of protection equally valuable to the settler and to the company, for the property of one means the property of the other.

ANTICIPATED RESULTS.

The Application Blank of the Kern County Land Company represents one of the most enlightened



A SETTLER'S HOME.

steps ever undertaken in connection with the settlement of western lands. It is evidence of monumental good faith. It stamps as genuine every representation made under the authority of this company. The acceptance of an application for the purchase of land carries with it the company's guarantee that the representations on which the land is sold are accurate, and that the hopes of the purchaser can be realized. It carries also the company's acknowledgment



"A FARMER'S BOY."

that the intending settler is entirely satisfactory to those who are guiding the development of the communities in the Kern Delta. The company can never tell the settler that he misrepresented his character, condition or expectations. The settler can never



A FIELD OF BEETS.

tell the company that it misrepresented the soil, climate and productions, the water supply or any other essential. On both sides everything is a matter of record.

It is confidently anticipated that the use of the application blank will largely increase the demand for Kern county lands and immensely enhance the character of the communities to be developed. And what good man, with a family to raise, does not desire to have the best possible neighbors, the best possible social surroundings, the best possible civic institutions?

WHAT ARE THE KERN DELTA COLONIES?

Lack of space in this article forbids any attempt

to describe at length the property of the Kern County Land Company. This is a matter to be studied in the beautiful literature with which the company supplies all inquirers. It is enough to say here that the opportunity for making prosperous homes is nowhere better than in the beautiful and fertile portions of California covered by this great irrigation system. For all information, both general and specific, address Kern County Land Company, Bakersfield, Cal., or the Chicago office, 918 Chamber of Commerce building, corner Washington and La Salle streets, or the New York office, 812 Bennett building, on Fulton street. London office, 44-46 Leadenhall street.



PEACHES AND NATURAL GAS.

GRAND JUNCTION, Colorado, is just now coming in for its share of glory and profit, it having been made known to the world for the first time, on a large scale, that the country surrounding this wonderful young city is capable of producing all of the finest deciduous fruits to perfection and in profusion. Everybody now knows about its great annual festival, called "Peach Day," but the world doesn't know that the very land that produces these peaches has beneath it a field of natural gas.

A combination of business men recently organized the Western Colorado Development Company for the purpose of sinking an artesian well, with which to water a large body of fruit land held by it, and were agreeably surprised to strike a heavy flow of gas. Experts who were here pronounce the find indicative of the presence of a strong oil field, but the members of the company incline to the belief that a much greater flow of gas will be encountered.

The company has leased over 4,000 acres of land, and it is its intention to prosecute the work and fully develop the gas or oil, and at the same time bring under irrigation a body of land comprising over 5,000 acres held by it, which of itself is a fortune. The prospectus of the company, which has been sent to many inquirers, is very readable matter, and many Eastern people, principally in Ohio, Indiana and Illinois, are becoming interested in the enterprise.

For size and prospective profit, the scheme ranks any offered in California, for the reason that the lands

here have not touched the boom figures which prevail in that State, and it has been proven, so the Colorado people claim, that the percentage of profit per acre is with them much greater. Certain it is that this point is less than midway from Chicago to California, and this of itself is a point in its favor, the fruit, in consequence of its proximity to Eastern markets, being picked at a riper stage.

The Chicago *Herald* of September 12 accorded "Peach Day" an entire telegraphic column on its first page and other Eastern papers and the Associated Press dispatches spoke in praise of the country and the efforts of its pushing people.

The New York *Sun* recently contained an article asking for better peaches, and the Grand Junction people think they have solved the problem.

They swept everything at the recent Nebraska State Fair, and

now have on exhibition in Denver several carloads of fruit of all sorts that is attracting crowds both night and day.

Several members of the late Irrigation Congress wound up their trip by taking in the sights at Grand Junction, and they were unstinted in their praise of the country and its products.

It seems that the city is the one place which will attract attention during the coming year.

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MENTION THE AGE.

THE IRRIGATION AGE.

VOL. VII.

CHICAGO, NOVEMBER, 1894.

No. 5.

THE PROGRESS OF WESTERN AMERICA.

The Winter's Outlook. The cause of irrigation, which is the cause of Western America, faces the coming winter with greater confidence than any other popular interest that can be named. It has practically no enemies. It has an increasing multitude of friends. The comments of leading newspapers from ocean to ocean, reproduced in the October number of THE IRRIGATION AGE, indicated the wide popular interest aroused by the recent Congress at Denver. Wherever one goes, from the Atlantic to the Pacific, from Minnesota to Texas, he finds irrigation a recognized and growing topic of discussion. That it is to be the next great national issue is as clear as the sun at noonday. It is with a feeling not merely of satisfaction, but of real joy, that the friends of this cause note its triumphant progress as evidenced by the widening interest on the part of the general public, by the growing and strengthening organizations in various parts of the West, and by the thoughtful and rather solicitous attention the matter is receiving at the hands of public men. The outlook for the winter's campaign is encouraging in every direction, as will be seen by a reading of the following forecast.

Work of the State Commissions. All the Western Legislatures will be in session during the next few months. In every State the friends of irrigation are organizing to make their influence felt in these bodies. The time has come when we may expect thoughtful attention, if not enlightened legislation, from the several legislatures. But results will depend more upon the friends of the movement primarily than on members of the Legislature. Every Western State has a representative in the National Irrigation Committee. Every such representative is empowered to create a State commission of five, including himself, and this commission stands for the purposes, influence and prestige of the organized irrigation movement of the United States. The commission is not official in the sense that it is authorized by law and paid out of the public treasury, but

for that very reason it is at liberty to perform great work. It is unhampered by anything except the instructions of the Irrigation Congress. These instructions are: 1. To call a State convention; 2. To formulate plans for the utilization of the Carey law; 3. To devise a plan for a State Engineer's office and administrative system. As these conventions are asked to present their conclusions to the governors and legislatures by January 1st, next, it is assumed that they will be held in November or December. The winter's campaign for irrigation in the West should therefore open with these State conventions, held under the auspices of the several commissions, the latter being directly connected, through their chairmen, with the National organization. The Chairman of the National Committee will shortly issue an address to the State commissions, outlining the work of the coming twelve months. Now, the extent of progress in each State is sure to be measured by the activity of the commission, and this activity will depend upon the success of the National committeeman in selecting his colleagues. The time has arrived when the selection must be made, and it is hoped that the full list may be announced in the next issue of this journal.

The Carey Law. The Carey law offers to the men of the West the most important opportunity for progress they have ever had. It imposes upon them the gravest duty that has ever confronted them. THE IRRIGATION AGE did not favor the enactment of the law last summer, because we were pledged to favor no definite action until after the Denver congress, and because we regarded Senator Carey's proposition as inadequate and calculated to postpone, rather than to assist, the solution of our Western problems in a comprehensive way. But the more the law is studied the better it looks, and before this country is one year older we may be able to see that the passage of the law just at this time was providential. But everything depends upon the manner in which the Western States deal with their

opportunity. If the law is used as a means of reclaiming land economically and putting it into the hands of actual settlers on reasonable terms, it will prove a boon and a blessing to the East and West alike. It will furnish labor to thousands of men at a time when it is sorely needed, and then it will furnish the laborers with homes where they may become independent. On the other hand, if the lands are obtained by syndicates and corporations, either to hold for their own uses or to sell to American citizens at prices which the public cannot control and which hold no fair relation to the cost of reclamation, then the West will be disgraced, irrigation will be discredited and our progress set back for many years. Doubtless there are men in each State whose mouths are now watering for the rich plum they see in the Carey law. But we shall never believe that these greedy appetites are in the control of a single Western State until the shameful fact has been demonstrated by actual experience. While there has been some reason to fear that during the past decade Triumphant Democracy has succumbed to Triumphant Plutocracy throughout the United States, we cannot believe that the great public assets, represented by water and land on the public domain, will further illustrate this dangerous tendency of our times. No element of our citizenship is so unfettered as the men who breathe the free air of the West. They are sometimes eccentric to the verge of crankiness, but they have evinced no disposition to be the slaves of class or party. We believe they will rise to the full height of their opportunity and see that the Carey law is utilized in the spirit in which it was passed unanimously by the Senate, with only nine dissenting votes in the House and promptly signed by the President.

**How
Wyoming
May Use It.**

The exposition of the Carey law published in these pages in October may be accepted as a very fair reflection of the views of Wyoming people, who originated the law. The article, we understand, was prepared with the coöperation and approval of the leading men of Wyoming. The most important suggestions in the article are contained in the following sentences:

The State to make contracts with construction companies or colonies for the reclamation and settlement within a named period of defined areas of land in the State for a specified sum, the State Board fixing the price per acre for which land and water must be sold to settlers. When the sum specified by the contract is realized by the investors in the irrigation enterprise by the sale of land to settlers, the lands remaining in the tract, if any, to be sold to settlers, the proceeds going to the State. In all contracts the ownership of water to be inseparable from ownership of land.

Or, the act might authorize the State Department to contract with construction companies for the reclamation of specified areas of land, segregated under the Carey act, fixing a maximum and minimum price which may be charged settlers for the land and water and retaining a nominal price per acre to be de-

voted to maintaining the department having in charge the control and supervision of the lands.

**Better
Than the
Desert
Law.**

Now, if this is the disposition of the prominent citizens of Wyoming, who have urged for years that the cession of the lands was the only practicable solution of our problems, and who scored a partial triumph by the passage of the Carey law, there is every reason to anticipate glorious results from this legislation. The Desert Land law has stood in the way of wise and honest development. When companies have used it as a means of acquiring the lands in large tracts it has been essentially dishonest. When they have not so used it, it has been disastrous, both to the company which built the canal without any control of the lands, and to the speculator who took up the land without any control of the water. Under the Carey law our States can instantly repeal the Desert law so far as it relates to tracts which they propose to reclaim. They can then give capital security upon both the water and the land, and guarantee a fair return upon its investment and that degree of control essential to successful colonization. The proposition as outlined in the sentences quoted, proposes that the States shall regulate the cost and character of works and the maximum price which settlers shall pay for the land. If such a policy is generally adopted it will offer far better security for investment than it now enjoys, while fully protecting the rights of the public. Every friend of irrigation must be delighted to see such propositions as this advanced by the champions of the law. If those who have opposed the policy of cession will now heartily unite in an effort to utilize the law wisely, rather than stand stubbornly in the way of progress, the early months of 1895 will have a most important bearing on future development. The State conventions should be soon called and largely attended. They should bring out all shades of opinion, but the common effort should be to use the law for the benefit of the West and the country, not to discredit it for the satisfaction of individual pique.

**Labor and
Homes
for the
Idle.**

There is another aspect of the case which merits the careful consideration of the public. Millions of acres of good land are already under ditch and awaiting settlement. But the people who are most in need of homes are unable to acquire these lands. To pay from \$25 to \$100 per acre for land and water right, to clear the ground, prepare it for cultivation, plant crops and await the harvest, to build a house and equip the farm with team and implements, requires some little capital. There are plenty of people who have the required capital, and they are beginning to seek these lands, but there is another great class who have no capital except their labor and possibly a

team, a few implements and some articles of household furniture. These are the people who most need homes, but how shall they acquire them on the public domain, even when cheaply reclaimed under the Carey law? How can they live for the first six or twelve months before the soil begins to yield the necessities of life? Tens of thousands of good citizens for the West could be speedily obtained if this part of the problem were solved. Here is a suggestion: Let the construction companies operating under the Carey law endeavor to select laborers who are also homeseekers. Let them pay the prevailing price for labor, \$20 to \$30 per month with board, paying a very small amount in cash and the rest in orders good for seed and provisions. Then when the laborer finishes his work on the canal let him select a tract of no more than 40 or 80 acres and immediately proceed to get it into cultivation, obtaining seed and provisions on the store orders which he has received instead of cash for wages during the building of the canal. He should be permitted to pay for the land out of the sale of his crops. This system would be a blessing to thousands of honest and industrious men now in need of labor and homes, and it would also be advantageous to the State and to the construction companies, as it would guarantee the rapid settlement of the lands. Perhaps this suggestion is not feasible, but if it is it will enable our Western States to come promptly to the front next winter and relieve the country of the pressure of idle men, or that proportion of them who really desire work to relieve immediate necessity and a chance to make independent homes, to provide for permanent prosperity. If such a system were made a part of the policy of our States, we believe capital would be much more readily obtained from Eastern centers than otherwise, for property holders in that section are quite as anxious to solve the question of surplus labor as Western men are to solve the question of surplus land. The *New York World* recently pointed out the startling fact that in that city the great sum of \$22,000,000 was paid out last winter for charity by municipal and corporation sources and that the amount had steadily increased in recent years at the rate of \$1,800,000 per annum. It then said:

This is certainly due to bad policies—to policies which have congested a dependent population in limited areas near the seaboard instead of encouraging it to push on to the still uncultivated continent beyond. In some way our dependent population must be induced to leave the cities. They must be set to digging their living from the ground. This will mean happiness for them and security for the government. There is absolutely no other way out.

Necessity of State Engineers. A State engineer and administrative department is necessary to the utilization of the Carey law. This department will make the surveys and plans of reclamation and supervise the works, whether built by public or

private enterprise. Every Western State and Territory should provide itself with the administrative system, at least on a modest scale, during the approaching session of the legislature. It is perfectly ridiculous that we should be constantly asking the nation to help us while neglecting to help ourselves in this simplest but most essential of particulars. Every Western State should proceed at once to study its water resources and irrigable land. It should have a State engineer, backed up by a good code of laws. It should insist upon rigid supervision of all new works, careful attention to water appropriations and proper division of the supply among appropriators. To permit waters to be recklessly taken and works to be built without any exercise of public authority is a wicked and criminal thing. It is laying up a legacy of woe. It evinces a shameful lack of public spirit and civic pride. To ask the Federal government for appropriations when we have done so little for ourselves should make us blush. Irrigation is to be the great foundation industry in seventeen Western States and Territories. An irrigation department, or some adequate provision for irrigation laws and their administration and for a study of water supply and irrigable areas, is as essential as any other feature of State government. Colorado Wyoming and California have benefited immensely from such systems, and there can be no worthy progress in other States until they have followed the example.

In Utah's Golden Valleys.

After the adjournment of the Congress at Denver, the editor of *THE AGE* devoted a few weeks to a trip through Utah and the Pacific Northwest. There is a genuine revival of irrigation interests in Utah, the classic ground of the industry on this continent. Utah is preparing her bridal robes. She will be married to the Union in the course of the next eighteen months. She proposes to make adequate provision in her constitution for the protection and encouragement of the industry on which her fame and prosperity rests. She not only has the million acres under the Carey law, but two or three times as much more as her wedding present from Uncle Sam. It will be most interesting to observe what use she makes of these lands. She has some very virile traditions in the matter of irrigation. Her canals were built and owned by her people. Her land was acquired in small holdings. The small irrigated farm is the corner-stone of the commonwealth. But more modern forces are being felt in Mormonland. Probably the new legislation will be something of a compromise between the economic doctrines of the church and the claims of private enterprise. Judge Shurtliff is the new member of the National Committee for Utah, and he promises to be a very vigor-



A SCENE ON THE WEST GALLATIN RIVER, MONTANA.—By courtesy *Northwest Magazine*.

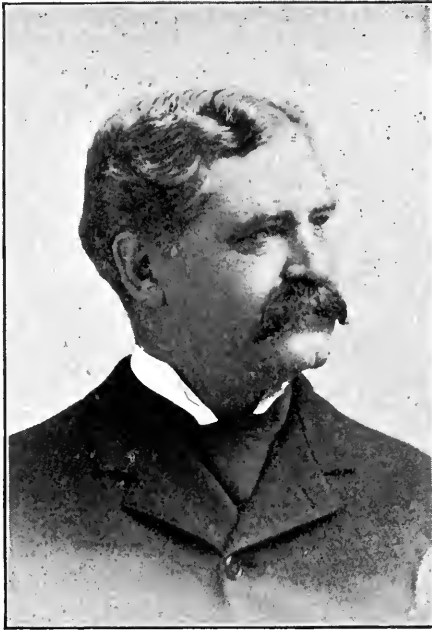
ous and effective member. He is planning a State Irrigation Convention with auxiliary associations in every county. Utah will be confronted with a unique problem before long. This will involve the abandonment of many of the old ditches and their replacement by a few larger and more comprehensive systems. There will be a great saving in the annual cost of maintenance, while the well-established and prosperous farms will furnish excellent guarantee of returns to the capital employed. The writer is indebted to Judge Shurtliff for the pleasures of a most memorable day—a day devoted to a drive of seventy miles through the golden valleys and interesting settlements of northern Utah.

In Southern Idaho, and notably at Boise, *Idaho as a Field for Homes.* Nampa and Payette, the writer found some peculiar conditions which account largely for the disappointments of irrigation investment. Large canals have been built, but the land has been gobbled by great numbers of speculators who have neither the money nor the disposition to improve it. The speculators cannot buy water and the companies cannot control the development of the land. Progress is being made and the future is full of promise, but the situation forcibly illustrates the evils of our wretched land laws. Southern Idaho will be the field of wonderful development in the next few years. It has the ideal climate for the Anglo-Saxon. The twenty-acre farm is large enough to support a family with comfort and thrift. Forty acres should be the outside limit for a family of ordinary means. Eighty acres constitutes a misfortune, and one-hundred-sixty acres a calamity. No ordinary family can cultivate so much land wisely and intensively under irrigation. And only wise and intensive cultivation fits the conditions of the arid region. Southern Idaho has the advantages of cheap land, ample water and good transportation facilities. To study the opportunities which it offers for the making of independent homes for free men is to experience a thrill which has not been felt since Abraham Lincoln signed the Proclamation of Emancipation. That meant much to black men. This means much to white men. Intelligent effort in the way of colonization will start Idaho upon a wonderful era of prosperity. She has all the elements of a great civilization except the chief one, which is men. She can readily sustain hundreds of thousands where she has tens of thousands to-day. The writer is under obligations for courtesies received at the hands of leading citizens of Boise, Nampa and Payette.

One-Crop Evil in Oregon. A very different condition of affairs was found in Eastern Oregon. Umatilla county, of which Pendleton is the chief city, represents the best and the worst that the mistaken phil-

osophy of the single crop can do for a country. Here is a region of fertile soil and delightful climate where men cannot make a living on 5,000 acres. They are raising wheat and wheat and wheat. They are dooming their children to hopeless competition with the servile labor of India, Egypt and South America. And servile labor has planted its heel on the neck of the free-born American citizen. The farmer is learning that speculation is just as bad in Oregon as it is in Wall street. Mayor Taylor, of Pendleton, has one irrigated acre that is worth more than 5,000 acres in wheat, because it supplies his family with all the small fruit, vegetables and poultry products they eat, besides a surplus exchangeable for much at the store. He has one cherry tree that earned more than a hundred bushels of wheat. The writer had the opportunity of addressing the citizens of this county in their Court House at Pendleton on the evening of October 1, and used it to proclaim the philosophy of the small, diversified farm, erected on the principle of self-sustenance, and carried on in the spirit of industrialism. He urged the people to build canals and advised that if they could not command aggregated capital they might command aggregated labor, as the Mormons did. Umatilla county is destined to be irrigated and settled in thousands of small farms. It is destined to realize a wonderful prosperity. And this will come when the ditch comes. And no citizen of Pendleton should rest until the ditch is provided, if he has to turn out with his own shovel and team to provide it. The writer returns thanks to Messrs. Livermore, Lowell, Taylor, Boyd and the citizens of Pendleton generally for very marked courtesies received, from the moment of his arrival at midnight until he departed thirty-six hours later at sunrise.

Different in Eastern Washington. The conditions in Eastern Washington are precisely the reverse of those in its neighbor, Oregon. In the Yakima valley of Washington irrigation systems are well under way and the country is starting in the right direction. There are few more beautiful valleys than that of the Yakima, and perhaps there are none where the chance for average prosperity is better. But even here it is desirable that the people should engage more thoroughly in diversified production. The thriving town of North Yakima imports from outside the pork products it uses during eleven months of the year, the surrounding farmers supplying but one month's need. So it is with some other items, while Washington as a whole sends away annually millions of dollars to pay for things which could be raised within its borders. The Yakima valley is very fortunate in soil and climate, as well as in nearness to the growing commercial outlets on Puget Sound. The surrounding mountain scenery is of the noblest, the



H. R. WHITMORE,
Of Missouri, President of Trans-Mississippi Congress.

great white domes of Adams and Rainier lending a strange beauty to the scene. There is no question but what a twenty-acre farm will meet all the needs of an ordinary family and lay the foundation of a competence as well. At a meeting of citizens of North Yakima, addressed by Wm. Ham. Hall and the writer, it was earnestly suggested that an attempt should be made during the coming season to illustrate the highest possibilities of the twenty-acre farm, aiming first at the sustenance of a family and next at a diversified surplus product for sale. The citizens appeared to take very kindly to this suggestion as one that would enable them to strikingly demonstrate to home-seekers the advantages of life in the valley. The writer received many attentions from the people of the Yakima valley, which he gratefully acknowledges.

The Valley of the Bitter Root. One of the strong points about our arid region is the fact that it presents a great diversity of soil and climate and therefore of production. This observation occurred to the writer when he faced the crisp air of an October morning in the Bitter Root valley of Montana and made a mental comparison of those conditions with the autumn climate of southern Arizona. Within the wide boundaries of arid America may be found almost every variety of natural conditions and the agricultural industry will present striking contrasts in consequence. Montana is very different from most

localities that are now putting lands upon the market. But it has many advantages, and there is every reason to predict that the new civilization will flourish there. This State is to-day a large importer of agricultural products which ought to be produced at home. At first thought it would seem that there would be but a narrow range of production in a climate where the winters are so severe, but when the writer studied the dinner bill at the best hotel in Missoula he discovered that of the thirty items in the list only three could not be produced on any farm in the Bitter Root valley. These three were the tea of China, the nuts and olives of Southern California. All of the meats, vegetables, small fruits and cereals, together with hardy fruits of the very best quality, can be had by the farmer who diversifies his products, even in this northern latitude. The Bitter Root and Missoula valleys are among the most attractive in the West, and capable of sustaining a dense population on forty-acre farms. Mr. Marcus Daly, on his fine ranch at Hamilton, near the head of the valley, is demonstrating what can be done in fruit culture. Again at Missoula, as elsewhere, the writer received courtesies which he desires to gratefully acknowledge, and nowhere was the enthusiasm over his remarks more cordial. Among the practical irrigators whom the writer was surprised and delighted to meet was the famous actor, Daniel E. Bandmann, who appears now only in the role of "Dr. Jekyll," having eschewed "Mr. Hyde."

Gallatin and Yellowstone Valleys.

The most prosperous looking portion of Montana is the broad Gallatin valley, where the land is quite fully occupied, but in large farms mostly cultivated in grain. The grain is of remarkable quality, and realizes fair prices. The country around Billings, in the beautiful valley of the Yellowstone, is also enjoying a fair degree of prosperity, but here, as everywhere else, it is the man with the smallest farm who is making the most money. The writer was honored at Billings with a good-sized audience, which gathered in the county court room during the busy hours of the afternoon. He had been given an opportunity to study the valley in the course of a long ride, and to talk with many of the most practical men engaged in farming by irrigation. Everywhere he found the people ready to concede the advantages of the small farm with diversified products. And the advantages of this system he urged upon the meeting of citizens. He also tried to point out the need of organizing industry, so as to have creameries, canneries, packing houses, and other establishments, to consume the products of the farms, and he urged the further necessity of organizing markets to take these products when they had been manufactured. The citizens were also earnestly advised to

develop at least one model farm of forty acres, producing everything that can be grown in the Yellowstone valley, and illustrating the highest possibilities of irrigation and home-making. Thanks are due the citizens of Billings for the very marked attentions the writer received.

North Dakota and Minnesota. The people of North Dakota are victims of the single crop system in a very marked degree. Fortunately the drouth prevailed during the past season, so that their loss in the production of wheat was less than it would have been if they had raised more bushels to sell for less than the cost of raising it. The writer found much interest in irrigation among the leading men of St. Paul and Minneapolis. There is talk of utilizing the water in the reservoirs at the head of the Mississippi for a ninety-mile canal, covering a district where crops are now precarious. The Twin Cities have a large interest in the development of the country along the line of the Northern Pacific railroad. By the way, the officials of this road are making a close study of irrigation possibilities. The writer accompanied Land Commissioner Phipps and General Agent Davis over a considerable portion of the Northern Pacific, and discovered that both gentlemen were very much in earnest about this matter. Editor E. V. Smalley, of the *Northwest Magazine*, to whom the writer is indebted for marked attentions, is also giving much thought and patient study to irrigation.

Trans-Mississippi Congress this Month. President Henry R. Whitmore, of St. Louis, is vigorously pushing the arrangements for the meeting of the Trans-Mississippi Commercial Congress, which will assemble in his city four days, beginning Monday, Nov. 26th. This has become one of the most important bodies of the kind known to American life, and the coming session promises to be the most interesting and effective in its history. Representatives of all States west of the Mississippi, as well as of Louisiana and Minnesota, will be present. Prominent topics of discussion will be silver coinage, irrigation, disposition of the Indian and public lands, the Nicaragua canal, a national bankrupt law, the improvement of western rivers and harbors, anti-option legislation, mining laws, and the admission of the Territories. A half day's session will be devoted to irrigation, with addresses by F. H. Newell, of the Interior Department; Elwood Mead, president of the late Irrigation congress; J. S. Emery, national lecturer; and William E. Smythe, chairman of the National Committee. The date of the congress has been made with a view to securing the attendance of members of Congress en route to Washington. It is hoped that a very large attendance of the friends of irrigation will be secured, and that the Trans-Miss-



WM. E. CURTIS.
Of Washington, D. C.

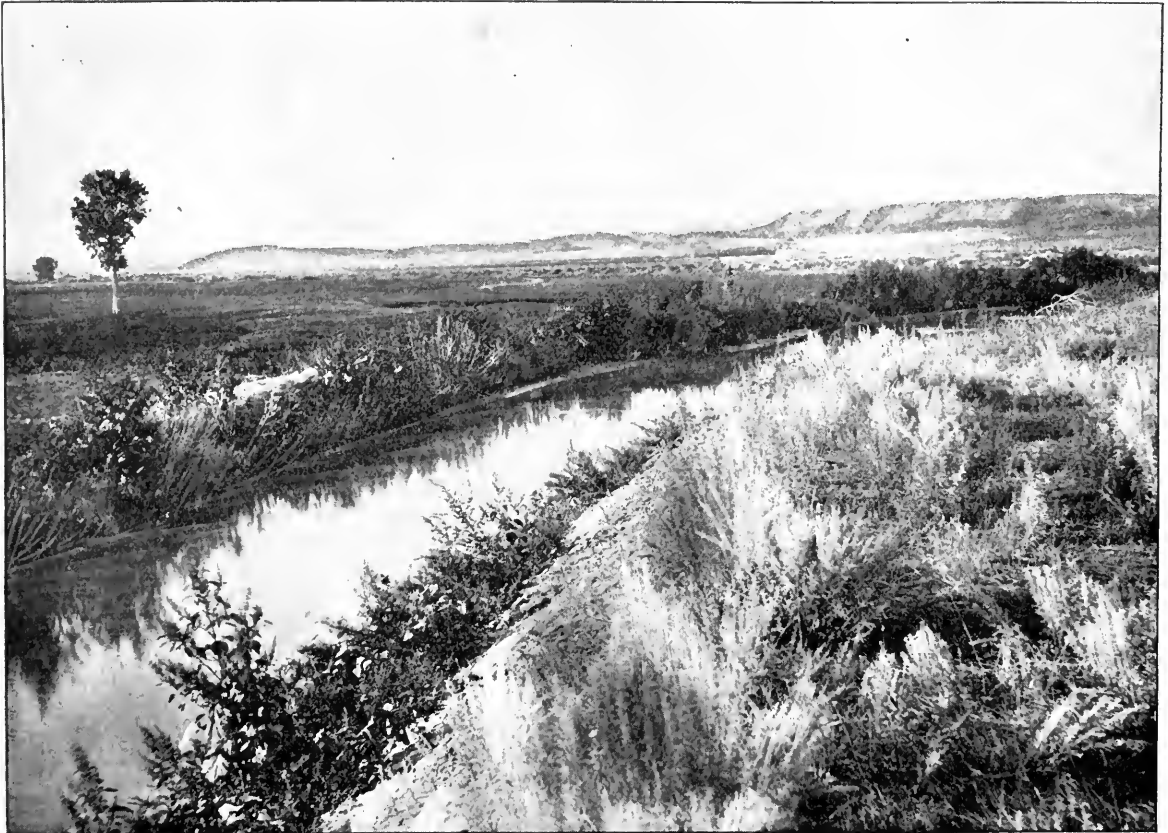
issippi Congress will go on record in favor of the policies advocated at Denver. President Whitmore is not only a very earnest but a very intelligent friend of the irrigation movement.

Mr. Curtis' Western Letters. The elaborate series of letters reflecting various phases of western life, political, industrial and social, which occupied a conspicuous place in the *Chicago Daily Record*, every day from the middle of September to the middle of October, attracted wide attention and very favorable comment. They were the work of Mr. Wm. E. Curtis, the distinguished Washington correspondent of the *Record*, the friend of Blaine and the former secretary of the Bureau of American Republics. Mr. Curtis has had the benefit of wide travel and observation and his contributions to current literature, as well as his admirable work on the lecture platform, have given him an enviable reputation. His entertaining book, "Capitals of Spanish America," is the standard work on its subject. His recent series of letters constitute a real service to the western people. Although his trip was a very rapid one and the work of furnishing three columns of entertaining matter each day severe, even for a writer of his experience, his judgments were generally very true and his pictures correct. He has succeeded in giving wide currency to the most attractive aspects of the irrigation industry, and has struck a number of telling blows in favor of the diversified farm.

**Wm. Ham.
Hall on
Laws and
Customs.**

The article by Wm. Ham. Hall in this number of THE AGE is one of the most valuable of recent contributions to irrigation literature. It goes to the foundation of laws and customs. It should be read by everybody, but especially by members of the State Irrigation Commissions and other public men. This article furnishes a lucid sketch of the Civil law on which irrigation rests in the Latin countries and strikingly portrays the disadvantages we labor under in the West in using the Common law of England.

Mr. Hall's future papers, which will be published in December and January, will give his views of the District system of California and his suggestions for the improvement of our statutes and methods of administration. These articles are the product of Mr. Hall's patient and life-long study of practical irrigation, of engineering, and of the laws, customs and traditions of irrigation in many countries. We ask for them a very careful reading in view of the importance of the subject and the high repute of the author.



VIEW ON THE TONGUE RIVER CANAL, MONTANA.—By courtesy *Northwest Magazine*.

IRRIGATION PRINCIPLES.*

I. WATER RIGHTS.

BY WM. HAM. HALL, MEM. AM. SOC. C. E.

THE fundamental principles guiding the development of irrigation in a country are found in its laws of waters. These have been evolved with and are dependent upon governmental rights and ownership of streams and their beds and banks, and the laws on which rest individual rights in property.

Aside from systems which may be classed as Mohammedan, Tartar, Hindu, Mongolian, and Confucian, found in such great irrigation countries as Turkey, Egypt, Turkestan, India and China, and others dominated and shaped purely by the monarchical idea of sovereignty, there are two great systems of law, each claiming a more liberal foundation, and each widespread in many lands.

The civil law was the crowning feature of civilization under the Roman empire. The countries of the German empire, Holland, Belgium, France, Italy, Spain, Mexico, and many others have it to-day.

The Common law is the envelope of civil liberty as it has developed with the English people. England, most of her colonies, and nearly all of the States of our Union have the Common law.

The first system, as it came to modern peoples, was then already pure and complete, codified after long centuries of application, and formulated through pure reason on principles of justice and equity, by minds as great and acute to the perception and ordering of these as any which modern enlightenment can boast.

The second is the result of gradual development, arrived at by the adjustment of principles to cases arising from time to time. It started amid conditions the outgrowth of the feudal system of mediæval times. And feudal rights and privileges largely influenced those portions of the Common law system relating to streams and waters.

WATER UNDER CIVIL LAW.

Under the Civil law water is the common property of all people. Except in that measure actually necessary for individual use it cannot be made the personal property of any man. A stream's channel may be in private ownership; and so, its banks; but its water is owned in common by the people at large. A stream may be public as to banks, bed and surface, but the water of this, too, is in distinct ownership, undividedly, in the people of the country. They each have a proprietary interest in it. It is not a public thing—belonging to nobody or to the great public as represented by government. But a thing owned by people, and every person of the country is part owner. This is an important distinction, as it has affected irrigation.

Thus owned, it is the ward of government in the common interest. Government looks after it not as its own property, not as public property, but as the people's property. For the benefit of all, it is protected from individual, private or corporate appropriation. Rights to its use are not acquired by the mere taking. They must be based on an administrative permit, and are subject to administrative regulation. They become fixed by prescription only; and this means use *from time immemorial*. No water right of modern origin in a Civil law country is fixed to a degree that exempts it from administrative regulation. Such regulation does not mean curtail-

ment or forfeiture, except as to waste and except in case of misapplication. It simply forces the claimant to comply with the terms of this concession, and to have regard for the rights of others, without forcing others to appeal to courts.

Appropriation of waters, as the term fits the practice in America, is not and never was a Civil law institution. The waters of streams in France, Italy and Spain—the Civil law irrigation countries *par excellence*—are not, and since feudal times have not been subject to appropriation. No right could be acquired to them by the mere assertion of claim and the action of taking and using, based on that assertion. In the eyes of the Civil law, the taking by an individual, without specific leave, a part of the common property of all the people, and appropriating it to his own use, is regarded as an act contrary to law—as stealing. It is stopped, just as other thefts would be, and, if persisted in, the thief is punished.

Riparian proprietors may temporarily take and utilize the waters flowing through or by their lands, but they can get no right to such use, except by prescription—use *from time immemorial*. Their taking may be summarily stopped by the administration, without resort to courts. They have no advantage over other land owners or other people in the acquirement of water rights. To secure the privilege of using an apportioned part of the common stock of water, all people are on a like footing, and all have to follow the same process of application to the administrative authorities. These rules apply to all streams except those insignificantly small, which rise on and remain within private lands. On these latter, riparian proprietors have more extended rights. But the volumes of water are so small in such cases as to render them of no public importance.

In guarding and regulating the use of the common stock of water, it is the object of administration in Civil law countries, simply to assure its useful, economical and advantageous application, and to prevent its private monopoly to the public detriment. There is no tendency to administrative interference with details of use, except to stop abuse. The issue of water rights for irrigation is preferably made to communities of land owners organized into districts, or to companies, for service to such communities. The concessions are made definite from the beginning. The employment of capital in irrigation enterprise—the construction and operation of water storage and water service works—is encouraged, and its investment is protected. But concessions to capitalized companies are always guarded by terms which prevent oppression of water users, and lead to ownership of the works and water rights by them, after a period generally ranging from 20 to 50 years.

A degree of stability and safety is thus assured to irrigation enterprise and irrigation, from the beginning in each case. The capitalized company has a clean-cut proposition to work on. With a reasonably good scheme its securities are at once recognized, and are marketable. If it is a specially valuable concession, from which large returns are estimated, it may have had to pay government a bonus for it. If a poor one, from the financial standpoint, it generally receives with it a subsidy, in order that it may

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be enabled to serve the community at the stipulated rates. In any event, there is nothing to prevent legitimate land speculation from accompanying the venture.

Such, substantially, is the Civil law irrigation system as it exists in France, Italy and Spain, with variations as to details, to-day. Great water-right litigations and legislative strugglings over proposed water codes and laws, disastrous failures of irrigation enterprise, loss of investments, oppression of irrigators, conflict of rights, and the multitudinous other tribulations to which irrigation development has subjected our country, are there unknown. The reason is not found in the different form of government or condition of society. It is traceable to the logical application of the principle that water is the common property of all people, and as such is to be guarded in their interest. That it is *not* a public property—belonging to no man—subject, as such, to private appropriation.

ENGLISH COMMON LAW.

Under the Common law of England, on the contrary, water is regarded as part of the stream, lake or pond in which it runs or rests. Some streams, lakes, etc., are private property, and others are public property. Thus, with certain limitations as to use in the interest of the public and of other owners, water in some streams, lakes and ponds is in private, and in others it is in public ownership.

To be in private ownership, subjects it to private use, regardless of the needs of the people at large, and subject only to check by the action of courts in protecting the usufructuary rights in it, of others, and the property rights of others to it or the stream, lake or pond of which it is part.

To be in public ownership, subjects it to appropriation to private use, where such use does not interfere with public interests in the stream, lake or pond or with other private interests therein, or usufructuary rights thereto. The water is regarded as that class of public property which may be converted to private possession without public or governmental permission or authorization. All the people are not supposed to have an interest in, much less an ownership of it, as a separate thing from the stream. If a stream, as such, is not injured to the *public detriment* by the diversion of its waters, the public is not supposed to be injured by such diversion. The people, except as a body politic—the public—have no property right, usufructuary right or other interest in it. They are not supposed to be abridged in their prospective or actual rights of property or of use, by diversion of water from streams. It is only when a person is a riparian proprietor that he has any individual or common rights in a stream, lake or pond, or the waters thereof. This is the Common law doctrine, pure and simple.

Every owner of lands on a stream's bank has, under the Common law, certain rights in the stream and its waters. He is thereby constituted a guardian thereof in his own interest, and he must assert and maintain his rights in court, when need be, in opposition to encroachment by others, else, within a limited time, he is estopped.

As this system grew in England—there being practically no irrigation diversions from streams, and lands being concentrated in comparatively few large proprietorships—there was no necessity for public administration of streams, and, so, the Common law does not contemplate such an institution. The riparian proprietors, in their own interests, guarded

the streams, each from the encroachments of the other. The stream was valued by them for itself. The water was an integral part of it. If taken out for use, it must be put back, without pollution and without diminution, before it came to lands of another. The courts really administered the affairs of streams, and riparian proprietors were the watchmen.

In a country all in personal ownership as England was, all streams and their waters thus had guardians. There were no public lands, no wide unoccupied wastes without a personal owner, no streams without a claimant, no water without a guardian; and no great demand for water separate from the streams. The crown, the church, the municipalities, and the nobles, practically owned the country. They were the riparian proprietors; they, virtually, owned the streams as individuals, and each guarded his rights therein, when necessary, by appeal to the courts; except in the case of the crown, whose order was sufficient to prevent abridgment of its rights.

Water-rights for purposes of diversion, when they were needed, which was very seldom, were acquired by appropriation as against the public and by negotiation with and payment to riparian proprietors, or by condemnation of such riparian rights in the public interest, and payment therefor.

There was no scarcity of water itself. It was only that the stream was injured for riparian occupation, that objection was made to diversion, ordinarily. Navigable rivers were virtually tidal estuaries, and diversion from the running parts of them above tidal limits did not affect their navigability below. Hence, the public took no interest in such matters except when a municipality asserted its rights as a riparian proprietor.

Hence, again, there was no distinct administration of streams, no public guardianship of waters in connection with the Common law public rights in them. Such, substantially, was and is the law of waters on this point in England. And, notwithstanding the fact that there has been but little diversion from streams, as compared to that in irrigation countries, England itself has been the theater of most extended and ruinous water-right conflicts, and is a country of water monopoly. The reason for this is found in the fundamental principle of law which makes water private property under some natural conditions, and leaves it public property under others, subject to private ownership or unregulated taking. The right of all people in and to a part of it is not recognized in the law which forms the basis of the system. If it had been, then it would have been incumbent upon government to protect that right. There would have been administration of streams, and riparian selfishness and appropriation greed could never have grown up.

These are the two fundamental principles which have most affected the development of irrigation systems in modern times: That of the Civil law, which makes water the common property of all people, and, as such, a subject for governmental protection from unlicensed taking by any person; and that of the Common law, which makes water a public property, and leaves it subject to be taken by any person having access thereto, who is not stopped by some other person having a claim to its remaining in its natural bed.

In most of our States where irrigation is now thought to be necessary we have the Common law, with all its shortcomings when applied in the development of irrigation.

AS APPLIED IN CALIFORNIA.

Of this group of States, California led off by its adoption in 1850. It is safe to say that the thought of irrigation never entered the head of any one member of its first constitutional convention and initial session of legislature, as connected with this water law subject. Probably not any one of the members would have known the difference in the principles involved, or appreciated the inevitable difference of outcome in their working, even if attention had been drawn to the subject.

Moreover, it was soon found that the Common law right of appropriation fitted the case presented in early California times exactly. The country was a wild, unoccupied one. There were no embarrassing riparian claimants. Waters were needed for mining. Local customs and laws based on the appropriation principle, immediately sprung into existence on every placer stream, and these, of course, stood the tests of the higher courts of the State, which were working under the Common law.

Before riparian interests had developed in a way likely to be interfered with by diversion of waters, all mining water rights had been adjudicated in the courts, adjusted among themselves, and become fixed by limitations. Then came, by custom and by statute, the extension of the privilege of appropriation to the acquirement of rights to use water in irrigation. It was very soon applied on streams where great and valuable riparian interests had grown up; and then followed the conflict.

It was a great conflict, and cost the principal contestants and the people of California many millions of dollars. It shook the body politic for twelve years. For eight years of that time it controlled legislation, and for an equal period it largely occupied and even sought to overawe the courts.

The appropriators, under the advice of their attorneys, contended that although the Common law had been adopted as a whole, the custom and right of water appropriation had been acquired with the California territory from Mexico which had Civil law, and had been continuously followed in the State, and recognized and made part of the law of the State by the decisions of the courts. They claimed that it was a new grafting on the Common law, and that it overthrew or put aside riparian rights.

The riparian proprietors claimed that the Common law, unmodified, was the one and only law on this point in the State, that it admitted of appropriation, but not as against the rights of a riparian proprietor, except adverse right be established by use and the running of time, under the statute of limitations.

The appropriators fairly shouted in one breath an appeal to have the old Spanish water law upheld and the doctrine of appropriation established.

The riparians with equal vehemence declared the appropriators' appropriation doctrine a curse, and the Civil law system inapplicable under our social conditions.

A more ridiculous spectacle could hardly be conjured up. Here were the best lawyers in the land inextricably mixed in their ideas on both sides of the question.

Had the demands of the appropriators prevailed—that the Civil law doctrine on this point be recognized as having been derived from Mexico—their cherished right of appropriation must have been swept away. The Civil law, even in Mexico, never recognized the right of appropriation of waters, as it be-

came established in California under the Common law during the mining period.

It permitted the unlicensed utilization of waters from streams, following upon "denouncement," in remote places where the administrative arm did not reach. But such privileges never became fixed or established as a property right, and always remained subject to administrative modification, abridgment and regulation.

"Give us the good Spanish law of waters," demanded the appropriators. "It is adapted to an irrigation region. This is an irrigation region." Let us examine that Spanish law of waters a moment, and see what they would have gotten.

It expressly says: "An administrative authorization 'is necessary for the employment of public waters 'for undertakings on public or private account.'" It nowhere says that any waters of a stream, lake or pond may be taken and utilized without such express authorization, except for drinking, washing, bathing, watering animals, and some other similar uses, known as "common utilizations," and for these purposes the mode of taking is restricted to dipping in a bucket, tub, barrel or the like.

The Spanish law of waters is the most complete, concise and express code, as applied to irrigation, in existence. The subjects of ownership and control of waters under all circumstances, of channels and banks, that of servitudes as relating to waters, channels and banks, of water rights and permits, and police regulation of waters and diversions thereof, are fully and systematically covered, but the word appropriation, *apropiar*, occurs but twice in the whole long document. Of these two times once is to say that a person may appropriate waters he brings to the surface by means of artesian wells on his own lands or those he has a well-boring concession on; and once is to say he shall not appropriate waters he may drain out of his neighbor's lands by digging a ditch or trench along or near the boundary line.

"The wording of the law itself appears to have 'been most carefully made to convey an exact 'meaning on this point. There are four verbs 'employed in speaking of the taking of waters under 'the provisions of the law, and of the rights acquired 'thereby, as follows: *aprovechar*, to apply to a useful purpose, to profit by, to usefully employ; '*utilizar*, to utilize; *usar*, to use, and *apropiar*, to appropriate. *Usar* or its derivations appears frequently; *utilizar*, quite frequently; and *aprovechar* 'is employed the greater number of times; while '*apropiar* finds place but twice in the entire law.'"—[Irrigation Development, p. 454.]

The Spanish water law, then, is most particular in saying that the only waters which a person may take for irrigation, without express leave—may appropriate—are those which he causes to rise to the surface by artesian borings on land he owns or controls. And it is equally particular in saying that waters of streams, lakes and ponds may be usefully employed, utilized, or used, only after an administrative permit or concession for diversion has been obtained, but not before. Moreover, this, substantially has ever been, in modern times, the French and Italian law of waters on this point of irrigation diversion rights. And all three of these systems, either in the laws themselves or in administrative regulations thereunder, specify in detail the modes of procedure necessary to obtain a water-right concession or permit for diversion of water from streams.

Had the appropriator party in California, therefore, during the irrigation water-rights conflict which was most actively in progress from 1880 to 1888, been granted their demand—to have the Spanish or Civil law customs and rules of irrigation rights introduced—they would have “reaped what they had not sown.” Their unlicensed appropriation, or taking of water without leave, must have been stopped. And they would have had a system of State supervision of water courses, with water rights issued and regulated by administrative officers.

The Civil law principle whereunder water in natural beds and channels is the common property of all men—controlled and protected by no man or set of men—makes it absolutely necessary that the government shall, by administrative regulation and super-

vision, protect the common stock and regulate its partitioning and utilization.

On the contrary, the principle which gives the bank owners—the riparian proprietors—on all streams the right to have such streams and waters remain practically undisturbed, makes them the guardians of streams, admits of appropriation, *in cases when they consent*; and, hence, governmental supervision of streams and diversions has not been deemed necessary, for the streams' protection. This is the Common law system.

But, except in our own States, this latter system, unaltered, nowhere in the world exists in an irrigation country. It is ill adapted to irrigation development. Can we better it? I shall attempt to answer this question in a subsequent article.

AMERICAN SOCIETY OF IRRIGATION ENGINEERS.

THE American Society of Irrigation Engineers was organized in Salt Lake City during the sessions of the First Irrigation Congress, September 18, 1891. The proposal to form the society originated with L. G. Carpenter, Professor of Physics and Irrigation Engineering at the State Agricultural College, Fort Collins, Colo. The idea met with favor at once and was adopted. The society organized by electing the following officers: President, Arthur D. Foote, of Boise, Idaho; Vice-President, Geo. G. Anderson, of Denver, Colo.; Secretary and Treasurer, Chas. L. Stevenson, Salt Lake City, Utah. The Board of Directors consisting of L. G. Carpenter, Fort Collins, Colo.; H. I. Willey, of San Francisco, Cal.; J. Sire Greene, of Pueblo, Colo., and the previously mentioned officers. No convention was held during the year 1893, but the following officers were elected: President, L. G. Carpenter, Fort Collins; Vice-President, Wm. Ham. Hall, San Francisco; Secretary and Treasurer, John S. Titcomb, of Denver, Colo. And these with the following named constituted the Board of Directors: Charles R. Rockwood, of Yuma, Arizona; C. K. Bannister, of Ogden, Utah, and Chas. L. Stevenson, of Salt Lake City, Utah.

The meeting recently held in Denver after the close of the Third National Irrigation Congress was a very successful one and was largely attended, all the prominent engineers in the country interested in irrigation being present. Among them may be mentioned the following: Prof. L. G. Carpenter, President, Fort Collins, Colo.; Wm. Ham. Hall, Vice-President, San Francisco, Cal.; John S. Titcomb, Secretary and Treasurer, Denver, Colo.; C. L. Stevenson, director, Salt Lake City, Utah; Geo. G. Anderson, Chas. P. Allen and H. L. Aulls, Denver, Colo.; C. S. Batterman, Aspen, Colo.; Morris Bien, Washington, D. C.; J. E. Belt, Minneapolis, Minn.; Edward M. Boggs, Tucson, Arizona; Dean Burgess, Omaha, Neb.; H. J. Chambers, Denver, Colo.; Arthur P. Davis, Los Angeles, Cal.; John S. Dennis, Ottawa, Canada; Adna Dobson, Lincoln, Neb.; W. W. Follett, Denver, Colo.; Walter H. Graves, Crow Indian Agency, Mont.; J. Sire Greene, Pueblo, Colo.; Richard J. Hinton, Bay Ridge, N. Y.; R. B. Howell, Omaha, Neb.; Daniel Krath, St. Francis Kan.; Allan G. Lamson, Boston, Mass.; J. S. J. Lallie, Wm. B. Lawson, Denver, Colo.; J. B. Lippincott, Los Angeles, Cal.; Edmund P. Martin, Denver, Colo.; A. J. McCune, Grand Junction, Colo.; Elwood Mead, Cheyenne, Wyo.; John H. Nelson, Denver, Colo.; F. H.

Newell, Washington, D. C.; J. E. Ostrander, Moscow, Idaho; William Pearce, Calgary, Alberta, Canada; Walter Pearl, Wm. A. Peck, P. J. Preston, Denver, Colo.; S. B. Robbins, Great Falls, Mont.; Ed. L. Rogers, Denver, Colo.; Fred J. Stanton, Cheyenne, Wyo.; O. V. P. Stout, Omaha, Neb.; John C. Ulrich, Denver, Colo.; J. Ramon de Ybarrola, Mexico City, and others. The papers presented at this meeting covered a wide range of subjects, and were very interesting. Many instructive speeches were made, and the society had the pleasure of listening to Senor Ybarrola describe the methods of irrigating, the crops and other features of interest to engineers, in Mexico. A few evenings previous to the regular meeting of the society, Mr. John S. Dennis, of Ottawa, Canada, Government inspector of surveys and irrigation, had the pleasure of addressing a few members on the methods practiced in Canada, and on the survey now being made in the province of Alberta, southwest of Calgary.

At this Second Annual Convention also were distributed copies of the first “Annual” of the society, a publication of 272 pages, and which contains a great number of very interesting papers on all phases of irrigation engineering by the most prominent men in the profession, fully illustrated with maps, sketches and engravings of some of the many great difficulties that have been met and overcome in the conquering of arid America. To accomplish this result, making a veritable garden of the desert, on which to erect the homes of thousands of contented and independent people, reservoirs, capable of containing millions of cubic feet of water, and canals many miles in length, carrying streams as great as many rivers, have been built, mountains have been tunneled, and the very bowels of the earth probed, requiring engineering skill and science of the highest order.

At the recent meeting the following officers for the coming year were elected: President, James P. Maxwell, of Boulder, Colo.; Vice-President, Edward M. Boggs, of Tucson, Arizona; Secretary and Treasurer, John S. Titcomb (re-elected), Denver, Colo.; Directors: Geo. G. Anderson, Denver, Colo.; Samuel Fortier, Logan, Utah; James G. Shuyler, San Diego, Cal. These with the foregoing named officers and the past presidents of the society constitute the entire board.

The society is steadily growing in membership and becoming stronger financially, and the prospects for the coming year are very bright.

HILLSIDE ORCHARDS.

A METHOD OF IRRIGATING ORCHARDS ON SLOPING LAND AND DIFFICULT HILLSIDES.

THREE different systems have been used to irrigate orchards on sloping land. First, the underground pipe system. Second, the system of grading the land until the surface is a plane and running the rows of trees in the direction that will give the ditches the proper fall. Third, the system of planting the trees in straight rows up and down the hill and running the ditches the same way. In using the third method a very small stream of water is turned into the ditch and it is allowed to run for a much longer time than if the ground was more nearly level. The second system was described in a recent issue of THE IRRIGATION AGE. The expense that generally attends the use of the first and second methods forbids their use except at experiment stations, and in the case of wealthy men who plant orchards for a diversion. The third is a poor man's method, but if the ground is at all steep it is difficult to keep the ditches from washing into gullies and there is generally an unnecessary waste of water. In the system here described the expense is trifling while the results will compare favorably with the more expensive methods.

The accompanying sketch represents an orchard planted in accordance with this system. The upper half is steep with a ridge running down the middle, while on the lower half the slope is gentler and the ridge disappears.

A B C D represents the ditch which supplies the water. To prevent waste the water in the supply ditch should have as great a velocity as the ground will stand without washing. In the more compact sage brush land a ditch to carry one-half a cubic foot per second can be given a fall of 4 feet in 100. In sandy ground the fall should be less. In order that the ditch may have a fall of 4 feet in 100 it is made in a zigzag with an angle every 25 feet until it reaches the point B, where the proper fall can be given by running to the right. The ditches at the sides are to carry off the waste water. The

curved lines represent the furrows which carry the water to the trees. These should be run on a uniform grade with an engineer's level. The fall they should have depends on their length. If they are but a few rods long they may be made level. I have found that for furrows 40 rods long a fall of 8-10ths of a foot in 100 feet does very well. These furrows should be run before the trees are planted and their distance apart should be the same as required between the rows, although the distance will vary somewhat with the change of slope. After the furrows are run the trees may be planted in straight

rows up and down the hill with a tree below each furrow. To run these furrows rapidly and accurately, the ground should be rolled and points located with the level every 25 feet, the rodman pacing the distances. To avoid the use of stakes the rodman may be followed by a man with a hand plow, running a furrow through the points located by the level man. It is well to run a horse-plow twice over these marks, throwing the furrow the last time down the hill. If the furrows become too far apart by reason of the ground becoming flatter, a short furrow may be run between as shown at E.

A useful implement in work of this kind is a short roller three or four feet long with a bulge in the middle to run in the furrow. It packs the ground and prevents the water from breaking out on the lower side.

The ground in the angles of the supply ditch is a good place to plant asparagus, hazel bushes, or anything requiring much moisture. Fruit trees may be planted in the angles of the waste ditches and cultivated by hand.

After the trees are planted the yearly plowing of the ground can be best done in lands running up and down the hill. The cultivator can be run both ways, but if the ground is cultivated up and down the hill the first time in the spring and the last time in the fall and the other way during the summer, the work of remaking the furrows is avoided.

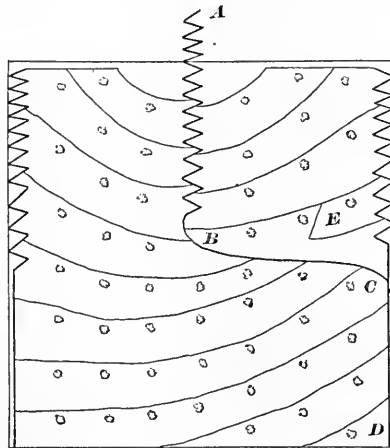


DIAGRAM.

PRACTICAL CANAIGRE CULTIVATION.

BY C. B. ALLAIRE.

IN the September number of *THE IRRIGATION AGE* appears an article on the cultivation of canaigre.

The author seems to have taken his text from Consul Monaghan's report and to have drawn some very queer conclusions therefrom.

In the first place, Mr. Monaghan's report is taken almost entirely from Bulletin No. 7, issued by the Arizona University, and so far is correct, but his conclusions are very faulty and show entire ignorance of the subject.

Your contributor does equally well as to his quotations, but his conclusions will hardly stand the test of hard business practice.

As to the "world-wide demand," any one who has had experience in the introduction of a new article of commerce probably knows that there is no such thing as a "world-wide demand" or a "long-felt want." There may be a possibility of a large market to be created, but it does not exist ready made.

There is no doubt that canaigre is a valuable tanning agent and that it is susceptible of domestication as a farm crop, and there are already many who would gladly engage in its cultivation if assured of a market. How is that market to be created? This is a far more serious question at present than the supply. The author of your article proposes that the natural growth on government lands should not be disturbed and he proposes and even insists that this growth shall be preserved as forests are preserved—by congressional legislation. It would be just about as wise to prohibit the use of the grass on the plains for the reason that some future generation may want to feed a horse or two. It would be well to consider before taking such action that a canaigre plant is not a tree, and if there is ever to be found a use for it, somebody has got to use it, and that the experimental stage of the article comes before the era of consumption.

If your contributor had any real knowledge of his subject he would know that there is annually rotting in the ground of the public domain a thousand times more canaigre than is now or ever has been consumed for any and all purposes, in any one year. Canaigre is indigenous to all elevated land between Central Texas and the Pacific, and between Southern Utah and Colorado and Central Mexico. It does not cover the land entirely, but grows in mountain gulches, sandy river beds and sandy hills and plains, on the tops of mountains, or wherever a loose, sandy soil is found. No one has ever made an earnest effort to secure seed roots for experiment, who was willing to pay for the labor of digging and for the freight, without getting all he wanted.

During the last year the writer has made shipments for this purpose to California, Arizona, Colorado, Kansas, Texas, Florida, Central America, Australia, and the Hawaiian Islands. The plant can't be eradicated by any ordinary means, as in digging enough small roots are unavoidably left in the ground to produce a new crop in a few years.

The shipments of the dried roots that have heretofore been made for export have been obtained from points adjacent to railroads. The goods are now selling at about \$40 per ton dry for Hamburg or Liverpool delivery. The foreigners will not pay more, and at this price it is impossible to obtain sup-

plies very remote from transportation lines, while the great bulk of the growth lies in such localities as railroads avoid in building, and is therefore perfectly safe for the use of future generations without any legislative enactment.

It is not true, though often asserted, that the supply of oak, hemlock, and other bark sources of tannin are becoming scarce. In Mexico, Oregon, Washington and Alaska enough bark is standing to-day to supply the probable requirements of the tanning industry for a hundred years, to say nothing of the supplies in Canada and the lake region. The adoption of canaigre, therefore, must be based on other causes than the probable failure of the supply of other materials. Canaigre differs from all other tanning materials in the class of leather it makes, as other materials or sources of tannin differ from each other. It has enough good qualities that other materials do not possess to justify strong hopes for its liberal use as an agent in the manufacture of certain grades of leather, but it will take years to bring these points to the notice of tanners and to induce them to use it liberally, or to such an extent as will make it an industry of importance.

While it is true that considerable gambier, cutch and terra japonica are imported, it is not because they are cheaper than oak or hemlock barks, for they are not; a pound of gambier tannin costs about 13c., while a pound of the bark tannin costs less than 6c., but it is because gambier gives certain desirable results that are not obtainable from the barks.

Canaigre makes an excellent substitute for gambier, having all the desirable qualities that gambier has and others that gambier does not supply, and it is a substitute for gambier and as a modifier of the bark tannages that will justify a liberal demand for canaigre when its merits are more fully understood.

As a crop on irrigated lands canaigre has advantages that make it very valuable in the economy of agriculture, not so much on account of any enormous profits that it will yield, as from the fact that with a limited water and labor supply the tillable acreage can be nearly doubled. It makes its growth in New Mexico during the fall and winter months. It should be planted early in the fall and winter months, and watered until the following March—probably six inches of water will make a full crop, though we are not aware that this point has been fully determined—at any rate, there is evidently more danger from too much than from too little water.

Weed seeds do not germinate in winter, and therefore only enough cultivation to keep the soil mellow would be necessary.

The harvesting can be done at any time during the year, though the roots are doubtless richest in tannin just before the new growth begins. The roots can be selected and prepared of uniform size, so as to be planted by horse power, and the harvesting can be done also by power. Manufacturers are preparing to meet the demand for this class of machines. The crop is not subject to any serious insect pests so far as known, and if it cannot be conveniently harvested at the end of the first season's growth it can be left in the ground for one or two years more and will increase in weight and value faster than money loaned at fifty per cent interest.

A VALLEY IN IDAHO.

BY J. M. GOODWIN.

THERE is a queer country lying west of the Utah & Northern Railway from Pocatello, Ida., northward to the Montana line. Starting westward from Blackfoot we soon cross Snake river, then pass over a level tract six miles wide, which is simply rich "bottom" land which is fast being reclaimed from desert through cultivation and irrigation. That district is rapidly becoming a rich garden spot because of the activity of settlers in doing just what is required to make the country bloom. The west side of this strip of bottom land, extending up and down the river for many miles, is almost walled in by the lava which in its flow stopped short and left a jagged face which has to be climbed over in getting on to the real lava plains, which extend westward fifty miles to the base of the mountains. These plains have but little to relieve the monotony of their vast territory of waste except the three buttes which rise as if out of a sea, like islands, and are well-known landmarks in this wilderness of desolation. In passing over these plains one seldom sees any animal life except such as are by nature specially adapted to such a home, among which are lizards, toads, black crickets and rattlesnakes, the last in the vicinity of the buttes being most numerous as well as most to be dreaded. Snake River valley extends six or seven hundred miles with hardly a break, and yet it possesses the same features throughout. Beginning at Shotgun creek, a point over fifty miles east of the railroad at Beaver Canyon station, all the waters from the mountains for a distance of about two hundred and fifty miles, sink into the lava through crevices and disappear upon reaching these plains. This water is supposed to come to the surface in huge springs along Snake river below Shoshone Falls in such quantities as to about double the volume of the river. To do this means subterranean rivers one to three hundred miles long. About sixty miles west from Blackfoot the western edge of the lava is reached at Arco, located on Big Lost river, thirty miles above its sink. This river rises in the high mountains and has a flow of 130 miles. In its valley the country at places is solid while at other

points the gravel and sands drink up the water and permit an under-flow for miles, to come again to the surface. Near its lower end the water gradually sinks for many miles not to rise again, and it all disappears on reaching the sink. This sink or basin extends several miles. In high water it is quite a lake created by the emptying into it of the waters of Big Lost river, Little Lost river and Birch creek, the three draining a country over 100 miles square upon which the annual snowfall will average over three feet.

But the writer is not so particular in calling attention to the wonders of this district as to mention a portion of country which offers inducements just now for a good irrigation enterprise. Above and near Arco there is a splendid country where the valley has widened out so as to embrace from 80,000 to 100,000 acres, which is rich in soil, and by irrigation could be made to produce grains, hay, vegetables, etc. It is, in fact, the best land of all Big Lost river and would be the easiest to cover with water through a canal which would not be expensive to construct. This canal should be taken out near Antelope, where it could not only get the waters of Big Lost river, but also the flow of Antelope creek. Settlers along the river have chosen lands down close to the water—bottom lands, they call it—which is not nearly so good as the land mentioned above, and which is in no way incumbered by locations or any other claims. There is an abundance of water, and if the copper mining and smelting enterprise at Houston, ten to thirty miles above this land, goes ahead as it promises to do, there will be a railroad through it at an early date, while the country will so prosper as to permit a good market for all products.

The writer has no interest in the development of this valley outside of seeing the country settled, and having lately passed over the lands referred to, and often been through that country, its importance has impressed itself so favorably as to suggest a description of it in THE AGE, that capital might be attracted to it and result in good to the country and to the men who will bring it under cultivation.

A METHOD OF ELEVATING WATER.

BY MCHENRY GREEN.

IN a copy of a Western paper which I lately read, I was particularly impressed with an article concerning the necessity of large wells from which to obtain water in good supply. In that article views were expressed on the properties of water which I had for a long time pondered in my own mind. Water in passing through or against surfaces does not generate "friction" as usually understood, but it has vastly greater gravity and inertia than people generally allow. Attempts are made to force water through great lengths of pipe and around corners with no adequate regard for its inertia. It is squeezed through turbine wheels and water motors as if it was air. In irrigation ditches we note how greatly even a growth of a weed or a tangle of grass checks the flow of water. In time of a flood a wide

stream is still insufficient in space to prevent the water filling up many feet deep, because it cannot run out fast enough.

After observing all these things it seems astonishing that men will attempt to raise or distribute water by means of a pump. To do so is a dead loss of at least one-fourth of the power available. Do not laugh at a Mexican wagon or an Egyptian plow so long as you use so clumsy a contrivance as a pump. Now a light wooden pump in a shallow cistern is a handy affair, and a pump is good enough where there is but a bucket or trough to be filled; but when it comes to lifting a large quantity of water it is absurd humbug to force it through intricate valves, pipes and suction. To watch such a process is painful. It is like digging a well without a windlass—toiling up a

ladder carrying the dirt in pails, when a windlass would make it ten times easier.

The right way to raise water in large quantities is by the use of an elevator. I do not mean a Chinese pump, which shoots the water up an inclined plane, for while this is a good thing in its way it still must overcome the inertia of the water to a great extent, or what the unthinking would call the "friction" of the water against the inside of the trough. What I do mean is a regular elevator, such as is used for lifting wheat or flour—an endless belt or cable carrying buckets, and running over a pulley at the top. The journals of this pulley ought to make the only "friction" allowed in the whole machine; for there need not be a pulley at the lower end, and the journals of the wheel at the top should rest on ball bearings like the wheels of a bicycle, then even that small friction would be reduced to a minimum. The buckets passing through the water at the lower end would have some little inertia of the water to overcome, in a movement of two or three feet below the surface, and this would be the greater with the increase of speed. Therefore put on more or larger buckets and calculate it to run slowly. The Chinese pump will not throw water at all unless it is run fast, and this alone ought to show that it must fight against a great amount of inertia or gravity of the water.

I have never seen such a water elevator as I have described, unless it be indirectly on the same principle in the use of the clumsy current wheel here in Colorado. Every windmill that I ever saw was hitched to a heart-breaking, back-breaking iron pump. It is willing and eager to do good hard work, but it is handicapped with the burden of a dead weight in an awful pump. Give it an elevator, with a single pulley hung on ball bearings running in oil, and a simple weight-wheel at the bottom suspended in the water without any journal, and the mill would fairly flood the land.

You say the windmill would run away and break itself. This could be prevented by a properly made governor. But I may at a future time venture some points on the subject of windmills, for as now made they do not suit me much better than the pumps.

One thing more. It may be asked how a perpendicular water elevator can be made to deliver the water at a distance. Make a broad screen upon which the water falls after reaching the desired height. Let it drain into a pipe, and conduct the pipe where you want it, and let the water wrestle with the valves and elbows to suit itself. But now if you are going to be stingy and narrow with your pipe you will soon hear from it, for the water will run over at the top. The water is going up, whether it goes down or not.

IRRIGATION BY ELECTRICITY.

OWING to the interest in irrigation by electricity at the present time, I desire to present a seeming possible and feasible plan for reclaiming and securing permanent prosperity to the arid and semi-arid regions of the West, by means of electricity. The statements made are based on practical experience and careful investigation and observation.

To accomplish this scheme requires capital, but the amount needed is small compared with the gains.

It is a well-known fact that in nearly all the arid land regions artesian wells can be obtained at a depth of from 300 to 600 feet, the water in these wells rising to within fifty feet of the surface. In some localities they flow. There are many places where abundance of surface water can be had by digging only a few feet. Especially is this the case near streams. To utilize water power costs much less than steam.

A power plant is imperative. The full capacity of a 10-horse power electric motor will yield power equal to a 10-horse power engine, and, if its capacity be not overworked, will last indefinitely. The same may be said of dynamos without regard to size.

The cost of a 15-horse power motor is \$500. Foundations, power-house, two 500-horse power dynamos with engines directly connected, and everything ready for operating, could be constructed for about \$36,000. The power-house, when run by steam, should be placed at a railroad switch. To construct for water power might cost as much, but the operating expenses would be much less.

A 600 foot well can be sunk for \$1,500. It takes 27,154 gallons of water to cover an acre one inch deep. A 15-horse power motor will pump 750 gallons per minute, and raise the water fifty feet. Seven hundred and fifty gallons will cover forty acres one

inch deep every twenty-four hours, or 280 acres every week. One well will furnish water during the irrigation season, from May 1st to August 31st, to cover 280 acres seventeen inches deep. This is an abundance for almost any crop, and a great deal more than most crops require. The water could be pumped into a ditch or reservoir. The well could be sunk where most convenient, as the power comes to it by wire.

One thousand horse power will run fifty-six 15-horse power motors, and will allow 15 per cent. loss for transmission of power from dynamos to motor. The lines for transmission, including poles, wires, etc., would cost from \$8,000 to \$10,000. Thus we see that 1,000-horse power would furnish an abundance of water for fifty-six times 280 acres, or 15,680 acres, about 24½ sections, at a cost, not including ditches and reservoirs, of about \$160,000, a very little over \$10 per acre. A larger amount is often expended in clearing some Eastern lands of timber and stones.

It takes three pounds of coal per horse power per hour, or 72,000 pounds for twenty-four hours, at a cost of from \$1 to \$2 per ton, according to freight, or \$72 per day for coal. The other power house expenses, including oil, can be run for \$18. One man, with the use of a horse, can look after ten motors, making an expense of \$10 per day, giving a total operating expense of \$100 per day, or \$12,300 for 123 days, the entire irrigating season, less than \$1 per acre.

In valleys where the fall of streams is not sufficiently rapid to admit of taking out ditches, ditches can be built, the stream dammed, and the water raised to the required height by pumps through means of pipes, each pump working by motor. It makes little difference whether the water be raised perpendicularly or otherwise.

TALKS WITH PRACTICAL IRRIGATORS.

POTATOES BY IRRIGATION.

BY J. W. GREGORY.

PROBABLY no other crop grown under irrigation is of more importance, all things considered, than the Irish potato. It enters largely, invariably and in a multitude of forms into all bills of fare, whether upon the home table, at the hotel or restaurant. The portability and keeping qualities of the crop render it available the year round and make it possible to ship the tubers to the antipodes to find a demand and a paying market. Hence any region of country that is sure to produce a fair crop of Irish potatoes of good quality, may very properly be considered a good and safe farming country.

Few, if any, of the crops grown by irrigation have led the producer a livelier pace to find out what to do and how to do it, to make sure of a good yield and a sound, merchantable product. There has been constant inquiry as to precise methods to be followed in growing potatoes by irrigation, and "established" rules and methods have been subject to constant disestablishment and change. Gradually some things have been found out, with reasonable certainty, about growing potatoes by irrigation, and the following paper upon the subject by a contributor to the Greeley, Colo., *Tribune*, will be found of interest and value. At Greeley potato-growing is the chief industry and a great success, and the potatoes are of the finest quality. The writer in question says: There was a time when the opinion generally prevailed among the Greeley farmers that very little water was needed in successful potato culture; no such idea prevails to any extent now. The original belief, or impression, arose from two sources. Old settlers who had grown potatoes on the alluvial margins of the rivers before upland irrigation was practiced to any extent in Colorado, had been in the habit of selecting choice places for this crop, where the undersoil was always damp and little artificial irrigation was required; they told us potatoes needed very little water. Next, in a majority of our upland soils, in the raw, unmaturing state, it was found that either early irrigation for potatoes or corn, or even later irrigation in excess, resulted in the first instance almost invariably in stunting the growth of the vine, which turned yellow and sickly after the application of the water; and in the second instance often checked instead of stimulated the growth of the tuber, and resulted in ill-formed potatoes and a small yield. Now we have ascertained that all this is the result of a condition of the soil; a cold mineral soil almost destitute of decayed vegetable matter, and having little soluble material in it for plant food, soddens down like a mass of plaster when water is applied, and plants, especially corn and potatoes, cannot assimilate much water to advantage when planted in such land. Constant stirring of the soil of course benefits the crop under such circumstances, but with a lean soil, whether of a sandy or clayey na-

ture, no one could tell before we resorted to heavy manuring of our lands, whether a very early irrigation rendered necessary from the absence of the usual spring rains, would benefit or injure the potato crop. Experience and practice are entirely different now. As we began to apply manure in quantities to our lands in order, primarily, to increase their fertility and the resulting yield, we made the discovery: first, that the plants needed more water or the manure would burn them; and next, that with richer soil and more plant food, rendered soluble and available with water and cultivation, both potatoes and corn could stand more water and earlier in the season, not only without injury but with material and perceptible benefit.

MORE WATER USED.

So now we use twice the water we used to think either safe or necessary. At one time in the history of potato farming near Greeley, we, all of us, figured that if it became necessary to irrigate potatoes to bring them up, the chances were just about even between total failure if we did not put on the water and a practically total failure if we did. Now, the moment we get done planting, if the ground is too dry to bring the potatoes up, and if the prospect of copious rainfall is not extremely favorable, no one fears and very few hesitate to furrow out the ground and put on the water at once; and if the seed is in fair condition it is the uniform experience that the young plants will push themselves through the earth in an astonishingly short time, and grow with vigor after they come up.

We used to believe that two irrigations were sufficient under ordinary circumstances, as to rainfall, to mature an average crop of potatoes. Three irrigations under the conditions of extreme drouth were considered ample; now we know better and we have not learned what we know about the matter from agricultural reports or treatises on irrigation from a scientific standpoint by civil engineers. All these sources of information have combined to instruct us in the pleasant but fictitious theory that as the country got older and the desert became subdued to cultivation, less water would be required; whereas the facts are that as the country gets older and improved methods of cultivation supersede the first primitive efforts; as the soil is enriched by liberal coatings of manure, or by the turning under of masses of alfalfa, rich nitrogen and other plant foods, more and more water is required to produce the best results. We irrigate our potatoes from four to eight times now and we know from experience, and not from theory, that if we could run the water down our potato rows once every week from the time it first became necessary or advisable to apply the water, until the growth of both tuber and vine was completed, the results would be all the better; only provided that the soil is well drained and thoroughly enriched with manure or alfalfa and that cultivation is thorough.

THE SUGAR BEET BELT.

BY W. C. FITZSIMMONS.

PROFESSOR WILEY, of the Department of Agriculture, alleges that after a number of years of careful experiment, it has been found that the sugar beet attains its greatest perfection, as far as temperature alone is concerned, in a zone of varying width, through the center of which passes the isothermal line of seventy degrees Fahrenheit for the months of June, July and August.

This isotherm begins at the city of New York and follows the Hudson river to Albany, thence to Syracuse, thence to Sandusky, Ohio, thence northwesterly to Lansing, Mich., its most northerly point in that State. From there the line drops to the southwestward and touches South Bend and Michigan City in Indiana; thence rises to Chicago, Madison and St. Paul, after which it moves a little to the southward into South Dakota, thence, turning northward, crosses the Missouri river on the forty-fifth parallel of latitude. From this point the isothermal line takes a direction almost due south and nearly following the one-hundred-and-first meridian of longitude until it passes out of the State of Nebraska into Colorado near its northeast corner. Bearing southwesterly it reaches Pueblo, Colorado, near the one-hundred-and-fifth meridian, thence turns southeasterly into New Mexico, then turns to the westward and crosses the one-hundred-and-fifth meridian near the thirty-second parallel of latitude. Continuing westwardly it passes on into California in an irregular line, thence by the same circuitous route across that State, Oregon and Washington.

Within a belt about 100 miles wide on each side of this irregular line, Mr. Wiley considers it safe, under present conditions, to plant sugar beets as a commercial enterprise. That is to say: The beet sugar area of the United States may be considered to lie mainly within this territory. No doubt there are many sections of limited extent outside of the belt above defined where sugar beet culture will be found a profitable business, while in many other sections within the belt it will be found by experience not to be desirable. But it is not merely a question of summer temperature. Soil, rainfall or irrigating facilities will be found to be equally important factors in the general determination. Were the entire territory embraced within the lines suggested herein adapted to beet culture, it could not of course be so utilized except to a limited extent. For, estimating that a ton of sugar may be produced upon one acre of land as an average, an area of less than seven million acres in extent would suffice to yield all the sugar now produced in the world, whereas the area we are here considering in the United States would comprise over four hundred million acres.

It will be thus seen at a single glance that we have a sugar beet belt in the United States capable of producing all the sugar that can be used not only in this country but in the entire world. And since other countries will continue producing sugar on a very large scale, it follows that nearly all of the territory above outlined must for all time be devoted to the production of other crops. Only those localities where the most favorable conditions prevail should therefore be brought under beet culture. The experiments thus far tried in Nebraska, California, Utah and a few other States have to some extent outlined the areas which may be most profitably devoted to the cultivation of the sugar beet. If the industry is to depend upon the natural rainfall, Professor Wiley

deems it important to select such localities as are sure to enjoy from two to four inches of rainfall per month during the summer. It may be said, however, that experience in California and other places proves quite conclusively that with proper conditions of soil and cultivation, the sugar beet may be successfully grown with a small amount of rainfall or irrigation.

In general, it may be said that any soil which will yield good crops of corn, wheat or potatoes will also yield profitable crops of sugar beet. A sandy loam, however, other things being equal, may be regarded as best adapted to the culture of the beet. The question of early and late frosts is a serious one in connection with beet culture. The best results, if other conditions remain the same, are to be reached in those localities where the longest season between killing frosts is found. So far as beet culture has yet extended in the United States, Southern California meets this latter condition most fully. But in the arid regions there are millions of acres nearly as well adapted by reason of soil, climate and other necessary conditions to the cultivation of the beet as Southern California; hence it is fair to presume that the future of sugar beet culture in America will be determined in the arid belt.

In the Poultry Yard.—If the slovenly custom of selling poultry by the "dozen" prevails in a given community, it may not be worth while to devote much energy to caponizing the male stock with a view to getting heavier fowls. But every man interested in progressive poultry raising should exert himself toward the discontinuance of the indefensible custom of buying and selling poultry by the dozen. The same is also true in lesser degree, perhaps, as regards eggs. Both poultry and eggs should be bought and sold by the pound, and if farmers and poultry fanciers in a given neighborhood unite in such a demand, the country storekeepers will most likely adopt the system. This one thing would probably do more to encourage the production of best breeds of poultry, both for flesh and eggs, than almost any other agency. Let everything in the poultry line be handled on its individual merits, and not bunched together indiscriminately in dozens without regard to size or quality. Relative to the age at which capons should be marketed (by the pound of course) authorities differ. Some allege that capons should not be kept beyond eleven months of age, and assert that if held beyond that age the flesh becomes "soggy" and far less palatable for the table. Experiments at the Oregon Station, however, would indicate that capons may be kept beyond the age above given, and that even fowls kept to the age of nineteen months showed none of the inferior qualities sometimes ascribed to birds held from the market to the age of say one year. The final recommendation of that station was to market capons at the age of thirteen or fourteen months from hatching.

Desert Crops.—James A. Hudson, of Chicago, recently spent a few days at Garden City, Kansas, the cradle of irrigation in that State, and carried home with him, to show what can be grown under irrigation, a goodly boxful of farm, garden and orchard products. Among the lot are a fifty-pound watermelon, an eighteen-pound beet, three "prizetaker" onions from a small patch which produced at the rate of 1,400 bushels per acre, several varieties of

fine apples, some big sweet potatoes from fields that have netted from \$100 to \$200 per acre per year for several years past, several half-grown heads of red Kaffir corn (the coming grain crop of the Great Plains), and, perhaps the most interesting of all to the Eastern farmer, some bunches of alfalfa. The display was gathered up in a couple of hours, and is neither so varied nor of such quality as it might have been. The apples are from the orchard of Capt. E. L. Hall, who shows sixteen varieties of apples from his orchard at the coming Finney county fair, the orchard not yet eight years old. These products of the once arid and desolate "Great American Desert" may be seen at Mr. Hudson's office at 4032 State street. At Garden City men are supporting their families upon three and a half to five acres of irrigated land, irrigated by pumping. So it is that homes of comfort may be made for millions of people in Arid America.

Feeding Values of Corn and Wheat.—Elsewhere in THE IRRIGATION AGE attention has been called by a contributor to the probable value of utilizing cheap wheat as a ration for stock of various kinds, including hogs fattened for pork. Experiments on a considerable scale at some of the agricultural experiment stations confirm the views therein expressed, and show with much clearness that when corn and wheat are the same price per bushel, a marked advantage is found in feeding wheat instead of corn. While a considerable variation in the feeding values was shown by the analyses of some 262 samples of wheat, yet the average was finally determined at 59 cents per bushel, or practically, one cent per pound. It is a little remarkable that the average feed value of the corn analyzed was 55 cents per bushel, or practically one cent per pound, the same as wheat. These figures relate to the feeding value, without reference to the value of the manure resulting from thus using the two grains. It has been shown, however, that 1,000 pounds of corn contain 16 pounds of nitrogen, 5.70 pounds of phosphoric acid and 3.7 pounds of potash, while an average of analyses of winter and spring wheat shows for each 100 pounds, two pounds of nitrogen, one pound of phosphoric acid and .65 pound of potash. From these data it is estimated that the manurial value of corn is 20 cents per bushel, and of wheat 24 cents per bushel. By proper care probably three-fourths of the manurial value of these grains may be saved, thus making the total feeding and manurial value of wheat 77 cents per bushel, against 70 cents per bushel for corn.

Cultivating Small Grain.—The cultivation of small grain so clearly and largely increases the yield that it will doubtless become a general practice among irrigation farmers to so plant their grain crops that cultivation may be systematically undertaken. Farming by irrigation is the perfection of farming. It should lead not only to the sure production of a crop every year, but to getting all that each acre will produce every year. Hence it will doubtless be found profitable to sow grain in drills twelve inches or more apart, and to make it a practice of stirring and loosening the soil between the rows. If a little extra labor and a little more care in irrigating the grain crops will both increase the yield of grain and economize the water supply—and such is undoubtedly the case—men who farm small tracts of valuable land by irrigation can only afford to bestow the extra labor and care.

Seed Potatoes.—Some farmers plant whole potatoes in the hope of a better crop or larger tubers, but the experience of a great number of advanced growers leads to the belief that fewer eyes in each hill will yield better results. It is claimed that when whole potatoes are used for planting, the great number of eyes which sprout have the effect to crowd the roots and stalks to the great detriment of the crop. Experienced potato growers allege that good results from such planting cannot be expected with any better reason than can a good crop of corn be looked for from the planting of entire ears in each hill without subsequent thinning. While it is quite probable this is an exaggerated statement, the experience of some of the most successful potato culturists in the country appears to establish the best practice to be the planting of pieces having but one or two eyes each, and then giving plenty of room in the hills as well as between the rows. It is a very common practice to allow too many stalks of corn to grow in a hill, and the same may be said of many other crops, as strawberries, raspberries, gooseberries, blackberries and currants. Vigorous thinning will be found to pay handsomely, for the overcrowded stalk or cane cannot give a good account of itself, and frequently leads to discouragement and loss. Plant the best seed, but do not plant too many eyes in a hill, is good advice to potato growers.

Good Domestic Stock.—On the irrigated farm, which should never be large, it must be constantly borne in mind that only the best domestic animals of any kind should be kept. Scrub stock has no proper place on the irrigated farm. It really costs but little more to keep a first class animal from which both satisfaction and profit may be derived, than to keep inferior stock which often consume more and yield a far smaller return. Especially should no inferior cows be maintained on the small farm, or any other farm, for that matter. But particularly on the small, snug, well-tilled, well-watered farm, the well bred and well fed cow of the most patrician lineage will be found by far the most profitable and desirable. In fact on the little farm the cow should be almost regarded as "one of the family," and treated accordingly. She should always be well housed, well fed and well tended. No fear need be felt that she will be "pampered" too much, for she will always give value in return for all she receives. Cows may be taught to consume a good deal of food about a farm which is ordinarily wasted, and careful attention in this direction may often result in the appreciable lessening of the expense of keeping by at least one-half. But above all things, the farmer on the irrigated farm should not attempt to save expense by stinting the rations of his stock. It is sure to be the ruinous policy of saving at the spigot while wasting at the bung.

New Uses for Reservoirs.—Although the man who, for the first time, contemplates installing a pumping plant to irrigate a small tract of three to five acres may at first grudge the amount of ground space which his reservoir will necessarily occupy, he will cease to do so when he realizes how valuable that space may be made. The people in Western Kansas who have been so successful in irrigating for some years past by the use of pumps, windmills and small reservoirs, declare that, by the production of fish and by the ice put up for home use and for sale, the area occupied by the reservoir may be made the most profitable portion of the tract.

A Hen Race.—A novel contest is in progress, promoted by the *National Stockman and Farmer*. It is an egg-laying contest, participated in by over two hundred contestants, and covering a period of one year. The racers owned by the contestants vary in number from three to two hundred. A similar contest four years ago was won by a pen of single-comb Brown Leghorns, which averaged 222½ eggs each for the year; a pen of Silver-faced Wyandottes second, with 200½ eggs each. The first six months of the present contest closed August 1st, with a pen of Brown Leghorns again in the lead, a pen of White Plymouth Rocks second. While such a contest as this will fall far short of attracting the attention bestowed upon a single "mill" between a pair of bristle-haired, broken-nosed pugilists, it is of more real value to humanity than the whole generation of "Jims" and "Jacks" and "Paddies."

Use Machines.—Among the labor-saving appliances with which people become acquainted somewhat slowly are the potato digger and the fodder harvester. Men are apparently conservative about utilizing horsepower in harvesting a potato crop or cutting up corn, cane and other fodder crops, although these are among the most tedious, wearying, irksome features of farm work. There are good, practical machines for doing such work, and horses are cheaper than men. It is well to save time and backache by doing such jobs by horsepower—and it pays.

Feed the Cattle in the Spring.—An experienced and observing Iowa feeder declares that if the cattle grower will take half his grain, which is to be devoted to feeding a bunch of cattle, and give it to them in the spring when grass is short, and then feed the balance in the fall, better results will be realized than if all the grain is fed in the fall.

Relative Values of Some Farm Crops.—Probably most readers of THE AGE, if asked the most valuable farm crop produced in the United States, would unhesitatingly answer, "wheat." Probably because we come into more intimate and extended personal relation with the wheat crop than with most others, this belief is very widely entertained in all parts, except, possibly, the Southern States. Cotton being there so preëminently the main crop produced in a number of States, it very naturally stands first in public estimation. The fact is, however, that hay is generally the most valuable crop produced in the United States, and for the year 1893 was valued at \$570,882,872. For the same year, the wheat crop was valued at only \$213,171,381; while the value of the corn crop was greater than either, and reached \$591,625,627. The cotton crop was worth about \$300,000,000, and the poultry and eggs marketed last year have been authoritatively estimated at over \$200,000,000, or practically as much as the wheat crop. Some conception of the extent of the swine raising industry in this country may be formed by the figures of \$270,384,626. for the value of last year's hog crop, given by the Department of Agriculture. Western pork packers alone paid the sum of \$166,000,000 for hogs packed by them in 1893.

A South Dakota farmer, residing near Howard, states that irrigating his corn once with water from an artesian well produced ears a foot long.

Beef Cattle Killed.—Statistics of beef cattle slaughtered at the principal points show that in 1888 the number killed at Chicago, Kansas City, Omaha and St. Louis was 750,000. In 1885 the number was 1,450,000, a gain of nearly 100 per cent. in five years, while in 1890 the figures reached 3,375,000, which showed a gain for the five years of over 110 per cent. But large as these figures are for the census year, the returns for 1893 show a total slaughter of beef cattle at the places named of 4,100,000 head. For the calendar year 1893 our exports of beef, canned, salted, fresh or otherwise, including tallow, amounted to 353,149,084 pounds, valued at \$28,727,933.

Hog Products.—Some conception of the magnitude of the swine interest in the United States may be formed, when we know that for the year 1893 the amount of hams, bacon, fresh and pickled pork and lard exported to foreign countries reached the stupendous amount of 821,990,390 pounds, worth \$85,860,162, or somewhat over ten cents per pound. During the same period only 148,897 pounds of mutton were exported, valued at \$12,174.

Butter.—During 1892 there were exported from the United States 11,395,424 pounds of butter, worth \$2,000,057, as against 6,994,310 pounds in 1893, worth \$1,347,742. Also 83,184,808 pounds of cheese worth \$7,835,229, against 69,374,802 pounds worth \$6,677,017 in 1893.

Arizona Potatoes.—Arizona is coming to the front as a potato-growing region. It is claimed that the rich valleys about Flagstaff yield potatoes in such abundance that, if there were facilities for reaching the markets readily, a single county would supply the whole territory with potatoes and have some to ship to other localities.

Few people probably have any conception of the amount of porcine jewelry annually manufactured in the United States, if rings placed in the noses of pigs to prevent "rooting" may be designated by that name. It is alleged by the *Merchants' Review*, of New York, that one firm alone makes some 16,000,000 hog nose rings annually, one machine making 200 per minute.

In reviewing the extent of our foreign trade during the past fiscal year, it is of interest to note that while the value of all exports was \$892,143,547, there were shipped from the port of New York alone products valued at \$369,146,365, or more than forty per cent. of the entire exports of the country. Boston stands as the second export point, and sent out products valued at \$84,000,000. Other ports in the order of their exports are: Baltimore, \$78,422,000; Philadelphia, \$40,500,000, and Savannah, \$25,527,000. Of the imports for the year, amounting to \$654,995,151, there came to Atlantic ports the value of \$537,639,095; to border and lake ports, \$41,692,558; Pacific ports, \$42,359,317; Gulf ports, \$27,796,696, and to interior points, \$5,507,485.

Honey made from the blossoms of the eucalyptus tree is reported to have great medicinal value, as well as all the toothsome qualities which should belong to the products of the hive. Consignments of eucalyptus honey from Australia to London are reported to have met with the highest favor and to have sold at very alluring prices.

Good Cellars.—Cellars wherein vegetables or fruits are stored for family use should be well ventilated. Everyone knows they are not, as a general rule. Physicians allege not only the possibility of contracting diphtheria and other diseases from fruit and vegetables kept in damp or ill-ventilated cellars, but the great and constant danger of contracting such diseases from the sources named. Diphtheria is reported to have been traced to germs taken into the system from handling and eating moldy apples. The greatest care should be taken to prevent dampness in and about the cellar. It is a fruitful cause of disease in many households without a doubt, but every good housekeeper will see to it that the cellar is properly ventilated from time to time, and disinfectants sprinkled about as occasion demands. In storing fruits or vegetables in the cellar it is best to put them into barrels or covered boxes, elevated a little from the floor to insure a free circulation of air. A fault with most farmhouse cellars is want of light and proper facilities for ventilation. The cellar windows should be large and adjustable, so that they may be quickly and fully opened for ventilating purposes, and, if necessary, curtains should be hung to darken the interior. In cold climates, double windows are often necessary; but they should be so adjusted as to swing readily, thus saving much time and trouble in opening and closing when desired. The contents of the cellar should be inspected frequently, and when showing signs of decay the fruit or other product stored should be assorted and the damaged parts removed at once.

Small Farms in France.—As an illustration of the prodigious aggregate wealth which an industrious and economical people may accumulate, there is perhaps no example in modern times more instructive than that of the people of France. There the small farm is the rule and the large farm the exception. By an old law requiring landowners to divide their holdings equally among their heirs the farms have been continually subdivided for the past hundred years, until thousands of holdings are now almost absurdly small. But these small tracts are so well cultivated, and the small economies of the little farms so admirably observed, that nowhere else in the world is there so much money laid away in safe places among any similar class of people.

As an example of thrift, the French people stand out the most prominent in the world to-day; and whenever any form of apparently safe investment offers—especially if the purpose be to forward some enterprise for the profit, honor or glory of France—the small investors flock into the money marts from all parts of the country. Not long since the city of Paris asked for a loan of some forty million francs to effect some municipal undertaking, and notwithstanding the stringency of the times, the loan was subscribed eighty-five times over within a few days.

Montana Products.—Farmers in the "Flathead country," in Montana, report this season oats six feet high, wheat nearly as tall and producing heavily, timothy six feet tall and with heads six inches long, making over three tons per acre; currants so fine that a single bunch filled a quart jar, and gooseberries as large as crabapples! Long-headed people, these flat-heads! Seems to be nothing the matter with Montana!

A Mushroom Bed.—We have called attention heretofore to the ease with which this valuable table delicacy can be produced if a little care and attention are devoted to their culture. The following is one method of making a mushroom bed:

"In a pine box about twenty inches in depth, and three feet square, place a four-inch stratum of a mixture of three parts of dry cow manure and one part of garden soil. Having procured some mushroom spawn, break it up and sow it in a second stratum of manure and earth two inches in depth. Slightly compress the whole and cover with an eight-inch layer of earth, which should be kept damp by watering through a fine nose nozzle.

"In six or eight weeks the first crop of mushrooms will appear at the surface, and will continue to do so for at least two years, provided the bed is kept damp.

"A small quantity of aqua ammonia added to the water with which the bed is moistened will hasten the appearance of the fungi.

"The box should be placed by preference in a place where the light is not too bright, say in a cellar in which the temperature is moderate and equable, or in a dark part of a stable."

Lose No Time.—Those of our Western readers who contemplate irrigating even but a small tract next season, by pumping, will be great gainers by beginning operations at once. Get your well, pump, mill and reservoir ready as soon as possible, and irrigate your ground in the fall and winter. It will pay you in several ways. You will test your plant and know its weak places, if any, and repair them. You will learn what the plant can do in the way of supplying water, and your ground, a good portion of it, at least, will be moist and ready for business at the earliest moment in the spring. By wetting up what ground you can in the fall and winter, you will both have earlier crops and be able to irrigate more ground through the spring and summer than if you began on dry ground at planting time. It will pay in many ways to get ready at once.

Feeding Wheat.—In view of the steadiness with which wheat continues low in price, and of the strong probability that it will continue low in value for some years, all information as to the feeding value of the grain is timely and important. A bulletin recently issued from the U. S. Department of Agriculture, Washington, D. C., compiled by D. G. Salmon, chief of the Bureau of Animal Industry, advises that all imperfect or low grade wheat be fed, and says that when wheat and corn are the same price per bushel it is preferable to feed the wheat and sell the corn, because wheat weighs seven per cent. heavier per bushel, and is, weight for weight, equally good for fattening animals and better for litter for young, growing stock, and, further, because there is much less value in fertilizing elements removed from the land in corn than in wheat and feeding the wheat keeps more valuable manure on the land. Wheat should always be fed in small quantities and, when possible, mixed with some other grain, and care taken to prevent any animal getting more than was intended for it.

HORTICULTURE BY IRRIGATION.

NECESSITY AND VALUE OF SPRAYING.

BY W. C. FITZSIMMONS.

NO commercial orchardist in any part of the country can hope long to preserve his trees and fruit free from the ravages of insects or disease without good care and cultivation from the start. The term "good care" is comprehensive, and embraces not only proper pruning and fertilizing, as well as watering where irrigation is required, but covers also the feature of using such means and appliances as are necessary to destroy or prevent diseases and insect depredations. In many if not most parts of country, the protection of orchards against fungous diseases and other incidents to the presence of insects of various kinds, is among the necessities which must be reckoned with by him who contemplates planting an orchard for business purposes in any part of the United States, whether in the irrigated regions or not.

As a matter of fact, it is found that the better conditions which may and generally do surround orchards planted on irrigated land are conducive to more healthy and prolific trees than if planted elsewhere. But even on the best of soil, and supplied with plenty of water and well cultivated, orchards are still liable to attacks from a legion of insect enemies which require vigilance to detect and promptness to suppress on the part of the successful orchardist. And it may as well be said here that he who is not vigilant and prompt in the detection of enemies to his trees and the administration of remedies is not and cannot be a successful orchardist.

VALUABLE REMEDIES.

In previous numbers of THE AGE attention has been called to this subject, and very full and complete tables of prescriptions for sick trees have been given. All fruit growers should study such tables carefully and keep them close at hand for ready reference. In a general sense, the most valuable remedies known to orchard therapeutics are Paris green, the Bordeaux mixture, and the lime, sulphur and salt compound. Nearly all the ills that orchard trees are subject to yield to a great extent at least to treatment by one or other of these remedies. They hold practically about the same valuable relation to diseases of fruit trees that quinine, morphine and iron hold to the diseases and distempers of men. The fact, too, that the scientific application of these poisonous chemicals to growing crops is a necessity to their proper growth and maturity, calls for men of more than ordinary judgment and culture for their proper application. Hence the commercial orchardist who makes a success of his calling is almost always found to be a person of superior intelligence and sound judgment.

And herein rests one of the most valuable and attractive features of fruit culture, especially in the irrigated regions. The business as there successfully carried on, attracts to its ranks the best talent and energy of the district, and they who stand highest in fruit culture in any neighborhood are almost sure to tower above their fellows in social education and business standing also. Perhaps it is, therefore, that insect pests and other woes that afflict the fruit

grower are not unmixed evils. If the business did not require the constant attention, the unremitting vigilance and activity which are the price of a fruit crop, it is quite unlikely that so many superior men would be found in that line of business to-day. To diseases and insects, to drouth and flood, to fungus growth and foot-rot, as well as to numerous other ills that afflict both tree and fruit, we no doubt owe to a great extent the splendid list of fruits to be seen somewhere in the market nearly every day in the year. These fruits have been produced by the men who have fought their way to success through all the difficulties that have beset them.

To Protect Orange Trees from Frost.—Our friends in Florida, as well as in California and Louisiana, may well profit by the suggestion made some time since by the Standard Oil millionaire orange grower, Col. H. M. Flagler, who is so largely interested in various parts of Florida.

In all the orange-growing States there is danger from frost. We are told of course that many orchards in all these States are "below the frost line," or are located within the "frostless belt." But unfortunately there are no frost lines that can be permanently traced, and the frostless "belts" are generally as mythical as the "lines." It is probably within the truth to say that 90 per cent. of all the orange groves of the United States are located where frost forms at some time or another. Many artificial devices to ward off the effects of freezing weather have been adopted, the most effective as well as the most expensive being the device of burning crude petroleum delivered through small iron pipes throughout the grove. This device was successfully operated last season by Mr. H. B. Everest, of Riverside, Cal., who, like Col. Flagler, is interested in the Standard Oil company. Perhaps Col. Flagler's plan would, however, be equally effective and less expensive. It would certainly be less expensive in Florida and Louisiana, where timber is plentiful and very cheap. Mr. Flagler's method is to provide a large number of posts, five or six feet long, cut from pine saplings four or five inches in diameter, and thoroughly saturate them with crude petroleum. On the approach of a cold night set these posts along the rows of trees as near together as required and light them at the top. They will burn for hours, producing a considerable amount of heat and a dense smoke which is liable to settle over the grove, and thus ward off the worst effects of the cold wave. It is not improbable that Mr. Everest's system of pipes, though costly to begin with, might prove the cheaper in the end, especially when suitable timber for posts is scarce or where the crude petroleum is not very cheap. If either of these methods on further test shall prove wholly effective, it would be the part of wisdom for growers in exposed places to unite and through coöperative effort establish these fruit-saving devices wherever required. More than 2,000 carloads of fine fruit were destroyed in California alone last winter, and almost every year more or less fruit is lost in all the orange-producing States from the effects of cold weather. In view of past experience it were wise in citrus fruit-growers to be on

the alert to protect themselves against this great enemy. It is not enough that growers shall protect themselves against insect pests, drouth and flood, for the losses from freezing weather are so great as to demand some security also from a calamity so liable to fall even from a clear blue sky.

THE EXTENSION OF FRUIT EATING.

The market for choice fruits is broadening every year as facilities for rapid and safe transportation increase and the fruit-handlers acquire broader experience as to methods of shipment. Not only are the growers enabled to reach more distant points, because of improved methods and means of transportation, but the people all over the country are using more and more fruit every year—when they can get it; and every margin of legitimate decline in selling price, made possible by increase of acreage devoted to fruit-growing, by improvements in varieties and in methods of cultivation and by cheapening rates of transportation, will greatly broaden the market for the disposal of the product. How short the time seems since California fruits were unknown in our Eastern cities. Now they go beyond the sea. The writer well remembers when, in his locality, oranges were considered a luxury of the very rich, and often buys a dozen of these fruits nowadays for the price of a single one then. It is a cause for congratulation to the people of the whole country that the production of fruit has so largely increased and an equally gratifying fact that there is still abundant room for an immense increase of the acreage devoted to such production. More apples and less fat meat, more pears, cherries, grapes, berries, and less and less hog and hominy will make healthier, happier, longer-lived people and tend to the betterment of society. Long wave the fruitful bough!

An Old Dominion Orchard.—Two brothers bought a tract of 500 acres in Loudoun County, Va., in 1887, and set it with fruit trees. The location is on the southern slopes of the Blue Ridge, where they believed fruit culture could be undertaken with good prospects of success. The first venture proved so satisfactory that the area has been increased from time to time until now they have 2,400 acres of orchard containing nearly fifty thousand peach trees, thirty-five thousand of them in bearing; fifteen thousand apricot trees; over eight thousand quince and fifty thousand vines. Large numbers of English walnut and other nut-bearing trees have also been set out. This is a large venture in the fruit line for Eastern cultivators, and indicates that Western methods are spreading. The next thing we hear will be that such orchards are multiplying, and that irrigation is systematically employed to insure crops.

Grapes in Texas.—A correspondent residing in the semi-tropical fruit belt of Southwest Texas expresses the opinion that that region is at least equal to Southern California as a grape country. Among the varieties mentioned as doing well are the White Muscat, Muscat of Alexandria, Black and Flaming Tokay and Purple Damascus.

Packing Apples For Market.—The apple season is at hand, and a word about packing for market may not be out of order. It may be said at the outset that farmer-packed apples are not generally approved by dealers. Whether true or not, it is al-

most the universal testimony of the men who handle apples extensively in the great markets, that they cannot depend upon the uniformity or strict honesty of home-packed apples. While it is probable that much of the inferior packing observed in all markets where apples are sold does not result from dishonest intentions, it is true that want of judgment, perhaps, and a lack of full knowledge of trade requirements, may create the same final results as deliberate dishonesty in the methods employed.

In the first place, every one who packs apples or other fruit for market, should do the work honestly and conscientiously. His quart measures should hold a quart of fruit, his bushels should be bushels, and his barrels should not be the smallest package that would pass under that name. The fruit should be carefully assorted as to both size and quality before being placed carefully in the barrel. No damaged fruit should be allowed to go into a barrel of apples whose brand would indicate first-class fruit. The fruit should be uniform in size. Put the large fruit by itself and the small fruit also into separate barrels, and then mark them so that the contents, their quality and size will be known before the barrel is opened. Above all, let no fruit packer be guilty of that transparent fraud of putting inferior stuff into the barrel and then facing at both ends with good fruit. English buyers do what all buyers ought to do. They open a number of barrels at random and dump the contents upon the platform in presence of buyers. It is clear that "faced" barrels fare badly under such treatment, as they ought to in all cases. If a grower grades carefully and packs properly he will never be ashamed to have his name known. All such should, therefore, for their own and their customers' protection, have their names and addresses clearly branded on every package of their fruit. Such a name, accompanied by fruit well packed, will soon be sought for by purchasers, and the reward of careful and straightforward business methods will surely come to him who fully deserves them.

In trade circles, the term "deacon packed" is an opprobrious epithet used to designate home packing by the "honest farmer." While farmers as a class are as honest as other men, it is no doubt true that very many of them do not realize the importance of absolute integrity in little things, not merely because "honesty is the best policy," but because it is right, which after all is the final test. But it must be remembered, especially in packing apples for shipment, that if not properly graded and packed, they almost invariably sell at the lowest value of the lower grades rather than the highest value of the highest grade, as is almost always the case with well graded and properly packed fruit. A considerable demand for our apples has already come from the markets of Great Britain, and if pains be taken to give our British brethren good value for their money, the market for our surplus apples in years to come may be very greatly enlarged. Honest packing of good, well graded fruit will surely meet all reasonable conditions of any market.

Some Facts About Bees.—The bee is certainly the most interesting of the winged insects with which we come into social or commercial relations. From time immemorial this industrious and wholly selfish insect has been held up to us as a model worthy for our adoption along many lines of endeavor. It would be impossible to estimate the value of the bee when

broadly viewed in time and space; for, from the remotest antiquity to the present day it has furnished mankind in many countries one of the most delicious of foods directly, while indirectly contributing to human welfare in a wholly incalculable degree. It has been long believed, if it cannot be said to have been positively known, that bees have always rendered the most valuable assistance in the pollination of fruits; hence, horticulture, as we see it to-day, would have been impossible, save through the active agency of the bee. But the average bee weighs but the five-thousandth part of a pound, and it is therefore only through association in vast numbers that its great work for mankind is accomplished. An average colony of bees comprises probably 20,000 to 25,000 individuals, though a large colony may number twice that many. When well loaded with pollen it requires only about 1,800 bees to weigh a pound, thus showing that in point of strength compared to weight the bee is far superior to man. That is to say, the bee can carry in its flight to considerable distances a weight equal to twice its own, thus certainly affording convincing evidence of its prodigious muscular power. It is asserted by those who have made deep study of Parthenogenesis in bees, that the eggs of the queen which have been fertilized produce the "neuters" or working bees, while those not fertilized produce the male bees, or drones, so called.

Great advances have been made in recent years in apiculture, and the large hustling commercial bee of the present time is essentially a different type of insect from that which characterized its ancestors of the days of the Pharaohs. More honey is annually produced in California than in any other State, and the crop has sometimes reached the amount of 9,000,000 pounds, as in 1884. The great abundance of flowers in that State and the general mildness of the climate make "bee ranching" a profitable business. In fact, the climatic conditions throughout the arid belt are especially favorable to the development of honey production as a leading pursuit.

Tillage is Irrigation.—A few years ago Stark Bros. planted a large orchard near Denver on land supposed to be irrigable. After the trees were in place the water supply failed, and a system of extraordinarily thorough and persistent cultivation was resorted to to keep the trees alive until water could be secured. They did so well that irrigation was dispensed with entirely, and the same thorough and persistent cultivation has made the orchard a big success. It is declared that the orchard is this season "a sight to behold," the trees being fairly loaded down with fruit. There are other striking instances, on the semi-arid lands, of the great value of persistent cultivation. It is a trite saying that "tillage is manure." It seems to be demonstrated that it is, in a measure, a substitute for irrigation also.

An English Example.—Fruit growing is quite extensively carried on in the Clydesdale district in England. Considerable attention is given to strawberries, and it is said that berries of the highest excellence are produced there. Some 1,500 acres are devoted to this culture and the annual product is alleged to bring to the growers the amount of £62,500, or say \$310,000. It will be seen that this means an average

of over \$200 per acre for the entire acreage planted. Other fruits to about the same aggregate acreage are cultivated in the Clydesdale district, but their annual yield is given at only £17,000.

The English fruit growers fertilize heavily and make no attempt, as our American fruit growers often do, to take from the land a large return each year without putting anything back in the way of fertilizers. In all branches of soil culture, whether general farming or fruit growing, the homely old adage, "feed the land and it will feed you," holds good. It will be remembered that there are no "inexhaustible" soils, of which we hear much. No soil in the world will stand successive cropping and give good returns without fertilization and reasonably good cultivation.

A Foreign Orange Market.—The Florida Fruit Exchange was instrumental in opening a trade in England for American oranges, having sent some eighty carloads to the Liverpool market last season. Until foreign competition became too strong these consignments brought fairly good prices, and the Florida fruit was held in high esteem throughout. A few California oranges were also sent to the English markets by some of the shipping companies of that State last year, and the outcome both for California and Florida shipments was such as to give encouragement that under reasonably favorable conditions a profitable market may be found beyond the sea for a considerable fraction of our citrus fruit crops.

Among the valuable lessons learned by orange shippers is that for long-distance shipments oranges must be prepared for the journey by a system of curing, requiring four or five days, and that to box and ship fruit direct from the trees is to invite disastrous returns, especially if sent to a distant market requiring several days, or perhaps weeks, to reach. But by proper exposure to the air and careful handling for a few days, the skin is greatly toughened and thus prepared to endure a journey that would otherwise be impossible.

Australian Fruit Growers.—In the well-known irrigation colony settlements made along the Murray river, in Victoria, Australia, by the Chaffey Brothers, about 10,000 acres are now planted with fruit trees and vines. Mildura and its environs now comprise about 4,000 inhabitants, where seven years ago the country was but a vast rabbit range. At present the number of holdings is about 600, and they range in size from ten to eighty acres, averaging about twenty-five acres. The principal fruits grown are figs, apricots, peaches, pears, olives, almonds and plums. Zante currants and citrus fruits are also grown and yield abundant crops.

Irrigation affords a very effective means of checking or compensating for the ravages of many sorts of insect pests by making plants so vigorous that they may successfully cope with their enemies.

Extraordinary developments in farming by irrigation are reported this season along the Tongue river in Montana. The culture of grain, hay and garden crops have all proven highly successful.

PULSE OF THE IRRIGATION INDUSTRY.

WATER STORAGE.

The Bear River Canal Company, of Utah, has recently been reorganized, the bondholders having purchased the property after foreclosure. Mr. W. H. Rowe, who was the appointed receiver for the property, has been chosen its president, and it is evident from the vigorous manner in which he is pushing settlement, and the cultivation of several thousand acres of the land under the several canals, that it will soon become a productive property.

Such undertakings require a comprehensive grasp of mind for their successful management. There are problems of every conceivable nature to be solved—it is virtually the building of an empire, and creating homes for thousands of people of every class and nationality, representing every industry. The investment of capital is necessarily large and the income must come from colonization. The work of constructing and colonizing lies along entirely different lines, and it is the experience of many companies that when they have finished the works and are ready for the delivery of water, their troubles have only just begun.

Most of the larger irrigation enterprises have been undertaken within the last five years, and the work of construction was nearing completion when the panic and succeeding business depression paralyzed every effort they might make to secure settlers. This was one of them, and while it was one of the best, both in conception and construction, as well as for the fine body of land reclaimed, it was found impossible to prevent default of its interests and foreclosure. As before stated, it has passed the ordeal without any great sacrifice, except of the interest payments for two or three years, and with a power of recuperation which will soon be made manifest. It is already to avail of the first movement of settlers, and to offer them inducements which cannot be duplicated elsewhere. Low-priced lands, of the very best quality, the productiveness of which is attested on every hand by the crops already harvested, may be purchased on easy terms, with an almost unlimited water supply. In fact, it is one of the very few locations where the supply of water is far in excess of the land that may ever be made available for it.

The engineering difficulties were very great, and more than a million dollars was expended in taking the water through and out of the Bear river canyon by gravity canals. All the rest of the construction was comparatively easy to cover more than 150,000 acres of as fine land as the bright sun of the inter-mountain region shines on. The canals for distribution are thoroughly well constructed, with drops at intervals, and with opportunities for the development of a very large motive power for manufacturing when it shall be required.

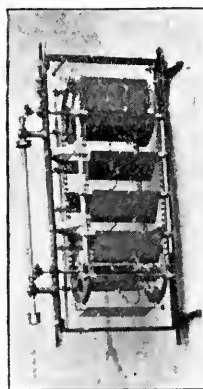
The headquarters of the company is located at Corinne, about twenty-four miles northwest of Ogden. At the latter place the same company owns and operates the street railways, one of the most complete in the inter-mountain country.

A CURRENT MOTOR.

Illustrated herewith, is a recent invention of Mr. J. E. Belt, of Minneapolis, Minn. All its friends believe it will be recognized at once as an important aid to the irrigation industry, rendering the reclamation of many fine bodies of land along the large and swift rivers of the inter-mountain region, easily possible at small cost, and cheapening construction in many other places.

It was exhibited at the recent Irrigation Congress, at Denver, and received the hearty commendation of many experienced irrigation engineers who were present.

It is very simply constructed, by the combination of two vertical shafts set at such distance apart as



CURRENT MOTOR

may be required for each particular situation. There are two sprocket wheels on each shaft, connected by link belts, bearing sheet metal paddles hinged at equal distances. These paddles, or blades, are set at an angle of forty-five degrees to the direction of the current. As they pass around the wheels in rotation they change position by the force of the current, under control of governing chains, so that the paddles are held in the same relative position to the current on both the upper and lower side. The paddles on the lower side have advantage in receiving the force of the water more

directly, owing to the deflection from the upper paddles, although they are set at the same angle to the belt. Guard rails prevent sagging with the stream.

The movement is aptly described by an observer of a fifteen-horse power motor in operation: "To watch the workings of this machine, even as small as it is, gives one a fair idea of the immense power it can extract from the current. The movement is not very rapid, but it seems as though nothing on earth can stop it. It is the steady, grinding, surly power that counts, and as the blades sail smoothly from side to side across the channel the motion is as strong and perfect as any mechanic could wish."

A gentleman who has studied it carefully and whose opinion carries weight, says: "It is adapted to every use to which water power may be applied, and saves the expense of dam construction and fluming. It utilizes the power of the current in places where dams are impracticable. It is simple, and may be constructed cheaply for any required service, easily protected, and equally serviceable at whatever depth submerged. It works equally well in a slow or rapid current, but accelerated velocity multiplies the effective power rapidly. It may be located in flumes along the shore, or may be set in mid-stream between piers to hold it in position, or

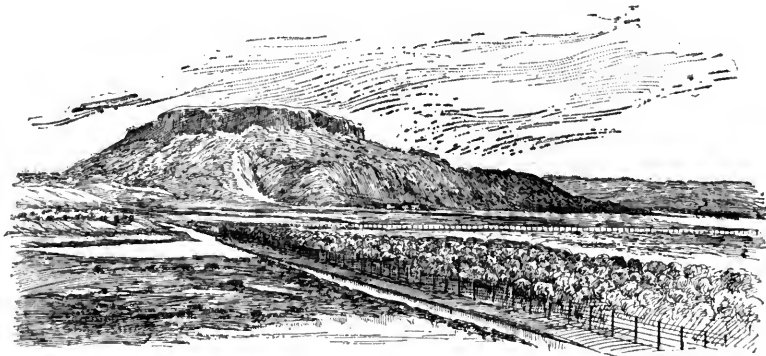
it will operate equally as well between anchored floats, rising and falling with the flood, and the power may be applied to pumps, elevators, or in other manner as required.

"Its power may be transmitted by belts, gearing, link belts or cables. It may be constructed for any desired service, according to the volume of water available, for from one-horse power to hundreds. It is durable, little liable to breakage of its parts, any of which may be cheaply replaced, and runs almost without care or expense. For irrigation works, it will save the construction of expensive headworks and main canals through canyons, which involves the employment of large capital as first cost and for maintenance, by raising the water directly from the streams at the most accessible points, in quantities according to immediate requirements, using the force of current in the passing stream for its motive power, thereby saving unnecessary investment.

and unpleasantness. The upper shelves of the oven warm the dishes to exactly the right temperature. Press a button and the coffee will be steaming hot; another button, and the eggs are beaten; another button, and the meat is chopped. The electric washing machines, irons and sweepers will change house, work from drudgery to a scientific economy of power. There seems to be no reason why the electric ovens should not take the place of the coal stoves. But we draw the line at the food cooked. We eat with too much electric speed already.—*Lewiston Journal*.

ESPANOLA VALLEY, NEW MEXICO.

The accompanying illustration shows the canal and other improvements that have been made during the present year by Mr. E. P. Hobart in the southern part of the Espanola valley, at Hobart, Santa Fé county, New Mexico. The canal is taken from the



ESPANOLA VALLEY, NEW MEXICO.

"It will be of very great utility in employing the power of the current in canals and laterals to raise water above the grade levels to land which is often by far the more valuable. They may be placed in succession in a line of flume, combining the power of several machines and using the same water as it flows from one to another. For transportation into mountainous country, it may be taken in pieces, and for the largest powers no single piece need weigh so much as two hundred pounds."

ELECTRICITY IN HOUSEWORK.

Electricity promises to solve the domestic problem. It is simply press a button and dinner is ready. An electric oven will cook a twelve-pound turkey in two hours and forty minutes, and no thought need be given it, while the kitchen is entirely free from heat

Rio Grande, which here furnishes an abundant supply of water at all seasons.

The amount and quality of the melons, vegetables, and other products that have grown under this canal the very first season is really wonderful. This valley is admirably adapted to fruit raising, and heavy shipments of peaches have been made this season from orchards but three years old. The demand from the neighboring towns has been much greater than the supply, and there is every assurance that the business will be permanently profitable.

KANSAS.

Finney county is making a success of raising alfalfa by irrigation.

There are 150 reservoir-irrigated farms in the vicinity of Garden City.

Meade county claims that her farmers sunk wells and used the water to irrigate with years ago.

The Arkansas Valley Land and Irrigation Company expect to sow 15,000 acres of wheat along the line of the A. T. & S. F. R. R. from Barton county to the Colorado line.

The great Arkansas valley is a first-class region for the pumping system of irrigation.

Prof. Haworth, geologist of the Kansas State University, says that the soil of Kansas and much of Missouri is bringing forth but a fraction of what it is capable. The wind power is unlimited. Rain falling on the surface even on the high plains finds its way downward to a hard stratum which holds the water, and it can be easily lifted to the surface by pumps.

The 32d Judicial District Irrigation Association at Hugoton recently completed its organization by adopting a constitution and by-laws.

Under the auspices of the Barton County Irrigation Association a test of the water supply at Great Bend was made at the request of E. B. Cowgill of the *Kansas Farmer*. The following was the result: Length of test, $7\frac{1}{2}$ hours, continuous run; amount of water pumped, 190,625 gallons; depth of well, 35 feet; amount of gasoline consumed, $5\frac{1}{2}$ gallons, costing 55 cents. Suction was through a six-inch drive point, and at the end of seven and a half hours there was no perceptible decrease in the amount of water pumped. The Weber Gas and Gasoline Engine Company furnished the engine.

Dickinson county is taking great interest in irrigation and many experiments are now being made.

Western Kansas will ask the legislature the coming winter to appropriate money to test the question of the underflow and its extent.

The Barton County Irrigation Company have begun a permanent survey of an irrigation-ditch that will water 200,000 acres of land in the Arkansas and Walnut valleys north of Great Bend.

A large irrigation convention was held in Concordia late in September. Four hundred people were present, and there was much interest aroused.

The Kansas State Irrigation Convention will be held in Hutchinson, November 25, and an immense practical display of all varieties of irrigation machinery is promised. There will be many prominent speakers.

The Second Annual Fair of Finney county, Kansas, which was held in Garden City, October 3 to October 6, was very successful, not less than 10,000 people visiting it. Garden City is the home of windmill irrigation, and the display of pumping machinery and appliances was complete in every particular. All of the prominent manufacturers of windmills, pumps and engines were represented and the display attracted much attention.

The agricultural and horticultural products on exhibition show that Western Kansas is a veritable garden spot, and capable of raising all varieties of fruits and vegetables when irrigated.

NEBRASKA.

Center township, Buffalo county, is agitating the irrigation question.

Hayes county expects to take advantage of the underflow from the Platte river.

Let your windmill soak the ground with water this fall.

Garfield county is actively interested in irrigation.

Work was commenced sometime ago on the Farmers' and Merchants' Irrigation Canal in Dawson county.

J. H. Wagner, of Wolbach, has invented a new irrigating machine.

The late meeting of the Nebraska Bankers' Association devoted considerable attention to irrigation.

The people in the vicinity of Sidney are sinking a number of wells to obtain the necessary water for irrigating.

The Lillian Precinct Irrigation Company, of Custer county, Neb., have twenty-five teams at work on their ditch out of the Middle Loup river.

The Middle Loup Irrigation Company have fifty team at work on the north side of the Middle Loup river.

The Nebraska Irrigation and Power Company have commenced active work on a ditch extending from one-half mile west of the town of Ericson, to the mouth of Clear creek, eight miles down the Cedar valley. This ditch will water 3,000 acres of land in Greeley and Wheeler counties.

Over 100 men are now at work on the Kearney canal in Nebraska. The new waste weir is being built of solid masonry, and will cost about \$20,000. In addition to supplying all the water necessary for irrigating, this canal will furnish a water power of about 9,000-horse power.

B. A. Jones' irrigation plant on the Lodge Pole creek is proving a great success. With a windmill and a deluge pump, invented by Mr. Miles, of Paxton, water is raised from a big well near the creek at the rate of about 400 barrels an hour.

CALIFORNIA.

The board of directors of the Modesto irrigation district recently sold bonds of par value of over \$80,000 and the work of completing the canal will be pushed rapidly.

The annual meeting of the stockholders of the Santa Ana Valley Irrigation company was lately held and a new board of directors elected. S. Armor was chosen president.

H. J. Langdon of Oroville is now irrigating 180 acres, and pumps the water through 4,000 feet of iron pipe and 1,500 feet of ditch. He estimates the cost at \$1.50 an acre.

The money collected in taxes last year by the Anaheim Irrigation district, before Judge Towner's decision enjoining the further collection of the tax, will be returned to those who paid it.

S. F. Leib of West Side in the Santa Clara valley has a very large and fine prune orchard which he has lately irrigated at great expense, but the yield has been increased so much that he estimates it will be but three years before he is repaid for the outlay.

The excavations for the dam in Von Segern canyon, near Escondido, Cal., have proceeded sufficiently to enable the men to begin masonry work. The dam, when completed, will be eighty feet high and will cost \$85,000, but its completion will not be necessary for the handling of flowing water the first season.

TEXAS.

An irrigation convention will be held in San Antonio, December 4th. It promises to be a very successful one and the State is beginning to take an active interest in irrigation.

A survey is being made of the country a few miles south of San Antonio preparatory to commencing operations on an irrigation ditch between the San Antonio river and the Corpus Christi road. Many of the farmers through whose land the canal will run have already signed articles giving it the right of way.

The California Irrigation company has secured subscriptions of 20,000 acres in the vicinity of Brownwood, Tex., and will begin work when 40,000 are subscribed. The dam will be thirteen miles north of Brownwood. The route is now being surveyed.

NEW MEXICO.

The Pecos Valley Irrigation company are making arrangements to build a canaigre extract factory at Eddy.

The irrigation work on the Navajo Indian reservation is progressing rapidly under the charge of Mr. E. C. Vincent.

SOUTH DAKOTA.

Over 1,500 square miles of territory have been surveyed this season for the proposed irrigation canals in the Jim River valley.

James A. Wilson lately purchased 320 acres of land three miles northeast of Armour, adjoining a farm of 320 acres, which he already owns, and will commence digging irrigating ditches at once. The supply of water will be obtained from a six-inch well.

There are nineteen wells now being used for irrigation purposes in Brule county, South Dakota, the average length of the ditches from each well being thirteen miles.

COLORADO.

The directors of the Fort Morgan canal, Fort Morgan, Colo., contemplate the building of a better system of checking the water at the head of the line.

Work on the enlargement of the Larimer County ditch in Colorado will be started after the water is out of the ditch this fall.

The board of directors of the Grand Valley canal, of Grand Junction, Colo., are contemplating the extension of the canal below Fruita. The extension will cover about 18,000 acres of fine fruit and farming land.

IN OTHER STATES.

Judge J. S. Waters of Hailey, Idaho, is interested in a project to water 10,000 acres of land in the Gunnison valley, twelve miles north of Green River Station in Utah.

Operations are about to be resumed by the Agua Fria Construction Co., of Benson, Arizona, and its magnificent irrigation enterprise will be pushed to completion speedily. A. R. Jennings, of Tempe, has a contract for 10,000 barrels of lime, and will begin burning at once.

Construction of the Clear creek canal in Wasco county, Oregon, which is to irrigate a large section of country, is progressing favorably. Water will be admitted to nine miles of the canal very soon and it is expected to have twenty-five miles completed this fall ready to irrigate next season's crops. Sixty teams

and 150 men are employed on the canal, and more are put to work as fast as they can be secured.

Construction work on small irrigation ditches in the Milk river valley, Montana, is very active.

Dr. N. G. Blalock, Chairman of the Washington Irrigation Commission, estimates that there are 2,400,000 acres of land susceptible of irrigation in eastern Washington; of this amount about one million and a quarter are in the Yakima valley. On the basis of twenty-acre farms Yakima could therefore support 60,000 people on irrigated land.

A canal is being constructed by the Fetterman Canal Co. in Converse county, Wyoming. The canal taps the North Platte river on its south bank about five miles above Fetterman.

D. R. McGinnis, secretary of the St. Paul Commercial Club, claims that 200,000 acres of land lying east of the Mississippi and northwest of Minneapolis can be made very valuable by cutting an irrigating canal from the Mississippi river, near Little Falls, and terminating near the Twin Cities.

Hahn Bros. & Co. of Muscatine, Iowa, are making a success of raising sweet potatoes by irrigation.

N. McDonald, a farmer of Hampton, Iowa, intends to irrigate next year.

The Goose Pond in Sac county, Iowa, is being surveyed by its owner, W. G. Press, for the purpose of ditching it. It contains 900 acres.

Work will soon be commenced on the Wide Hollow canal in Washington by the North Yakima Canal company. It will be sixteen miles long.

The farmers along the Prosser Falls Irrigation company's ditch have harvested a large corn crop, although in many instances this is the first time seed has been planted.

Owen Burr, a market gardener of Flint, Mich., is preparing a system of irrigation for his premises. He will use the water from Gilkey creek.

FOREIGN.

A scheme is being advocated for the undertaking of enormous irrigation projects in Western Central Asia, the proposed scene of operations being in Western Turkestan. This region contains about 300,000 square miles. The soil is good and yields all the products of the temperate zone. Russia is interested in the project.

At Spreckelsville in the Hawaiian Islands an immense area of worthless sandy plain was brought under cultivation by the digging of an irrigation ditch seventeen miles long. This is but one of the various enterprises which have been carried to success by Americans in these islands.

RECENT LEGAL DECISIONS.

Enjoining Sale for Void Assessment.—Where an assessment for irrigation purposes is void because not authorized by vote of the electors of the district, a sale thereunder will be enjoined, as such invalidity would not appear in the tax deed.

Woodruff v. Peery. (Supreme Court of California.) 37 Pac. Rep. 526

Rights of Irrigation Company.—Laws 1887 authorized an irrigation company to construct waterworks for irrigation, and section 12 gave it power to acquire property "necessary for the construction, use, supply, maintenance, repair, and improvement of said canal or canals and works, and all necessary appurtenances." It was held, to authorize taking land for constructing a pipe line.

Kialto Irrigating Dist. v. Brandon. (Supreme Court of California.) 37 Pac. Rep. 454.

Adjudication of Priorities.—Where an irrigation district is divided by a legislative act without a saving clause, before the adjudication of priorities therein in pending proceedings for that purpose, the district court of the proper county in the new irrigation district had jurisdiction to determine the priorities in such district.

People v. Downer. (Supreme Court of Colorado.) 36 Pac 787.

The Supreme Court of Montana holds that where one carrier uses water appropriated for his land, but from time to time diverts it through different ditches, the abandonment of one ditch does not constitute an abandonment of the water right, so long as the water continues to be diverted through another ditch. And where one's appropriation of water is not more than enough for his lands available for irrigation, his appropriation is not cut down, by the subsequent appropriation of another, to an amount sufficient to irrigate the land he had already under cultivation.

Klenschmidt v. Greiser. 37 Pac. Rep. 5.

Validity of Excessive Levy of Assessments.—The organization of an irrigation district cannot be collaterally attacked in an action by landowners to enjoin the collection of assessments by the officers of the district. Under the Wright Act (section 22) which provides that the board of directors of an irrigation district shall levy an assessment "sufficient to raise the annual interest on the outstanding bonds" of the district, such board has no power to levy an assessment in excess of such an amount. A landowner cannot enjoin the collection of an excessive levy of assessments by the board of directors of an irrigation district until he has paid the amount the board had the power to levy.

Quint v. Hoffman. (Supreme Court of California.) 37 Pac. Rep. 314.

Construction of Contract to Furnish Water.—A grantor conveyed a portion of a tract of land and also conveyed to the grantee a certain portion of all the water rising on the tract, and covenanted to suffer the water to flow to the grantee's lines through a trench which the grantor was at the time using. There was no way provided for measuring the water at the grantee's line, but it was to be taken from a reservoir on the grantor's land, being permitted to flow to the grantee in an "augmented head" once in 10 days. The place of delivery of the water was at the reservoir, and not at the grantee's line, he having an easement in the trench for that purpose. On abandonment of the trench by the grantor it was the duty of the grantee to keep it in repair. The "augmented head" provided for must be limited to the capacity of the trench at the reservoir, and any change in the delivery of the water from the reservoir, provided the discharge still equaled the full capacity of the trench at the reservoir, was permissible. The covenant for the delivery of the water was a covenant running with the land.

Bean v. Stoneman. (Supreme Court of California.) 37 Pac. Rep. 777.

The Supreme Court of Nebraska holds that a proprietor may not collect surface waters on his estate into a ditch or drain, and discharge them in a volume on the lands of his neighbor.

Lincoln Street Railway Co. v. Adams. 60 N. W. Rep. 83.

Sale of Stock of Irrigation Company.—Under contracts for the sale of land with stock in irrigation companies, clearly expressing the intention that payment of the consideration covering both land and stock shall precede the conveyance thereof, the covenants for payment and conveyance are not dependent, even as to the last installment of the price, when payable by installments, but payment is a condition precedent to the right to a conveyance, and an action for the price may be maintained without conveyance or tender thereof, on allegation of readiness and willingness to convey. Where payment of part of the first installment of the purchase price of the land is accepted, and both parties afterward treat the contract as subsisting, the purchaser cannot claim that it was terminated by his failure to pay in full. A contract for the sale of land with a certain number of shares of stock of an irrigation company, representing a corresponding number of inches of water, the stock to be delivered and accepted subject to the by-laws of the company, such statement as to the quantity of water being matter of description only, does not entitle the purchaser to water rights, as distinguished from stock, but requires the vendor to deliver the specified amount of stock in the designated company, which will attach to the land and entitle the purchaser to the quantity of water represented.

Loud v. Pomona Land & Water Co. (Supreme Court Rep. 928).

ARIZONA DECISION.*

Uninterrupted adverse possession of water rights for five years under a claim of right gives a valid title.

Declarations made by parties claiming a water right that they would not permit a person to have any of the water, if made in the absence of such person and without his knowledge, are not admissible in evidence against him in an action brought by such claimants to recover damages for the water taken by him.

Where one person makes declaration to another that a third person is a joint owner with him in a water right, and such other person, relying on such declaration, purchases the interest of

the third person, records his deed and enters into possession, the person making the declaration will be estopped from denying the right of such purchaser and those claiming under the person who made such declaration will be thereby put upon inquiry as to the true state of such title.

John G. Campbell and James M. Baker v. D. M. Shivers, 1st Arizona Reports, 161.

NEW COMPANIES.

Arizona.—*Phoenix.*—The Colorado Canal & Land Company are reported as having filed articles of incorporation.

California.—*San Dimas.*—The San Dimas Irrigation Company will supply water to the San Jose tract and additions thereto.

Redlands.—The New Bear Valley Irrigation Company.

Los Gatos.—Las Vegas Land Company, incorporated by W. H. Cross, Walter Griswold, Los Gatos; Warren G. Tomilson, Saratoga; J. M. Zollars, E. J. Crandall, San Jose. Capital stock, \$100,000.

Colorado.—*Denver.*—An irrigation company has been organized under the charter granted the Greeley County Water & Irrigation Company four years ago. Capital stock, \$5,000.

Denver.—The Clear Creek Pumping & Irrigating Company, incorporated by Eugene Buchanan, Dixon Buchanan and W. E. Crissman, will operate in Logan county, Colo. Capital stock, \$50,000.

Idaho.—*Payette.*—The Idaho Orchard Company, limited, incorporated by J. J. Toole, F. C. Moss, David Gorrie, D. C. Chase and I. K. Berry. The capital stock is \$5,000.

Kansas.—*Topeka.*—The South Fork Irrigation Company of Ulysses, Kan. To construct and maintain dams and canals in and along the South Fork and Cimarron river in Grant county for irrigation purposes. Officers and directors as follows: President, W. E. Hutchinson, Ulysses; secretary, J. T. Elwood; treasurer, D. E. Nicholson, Zionville; T. H. Harris and L. P. Main of Zionville are additional directors. Capital stock, \$5,000.

Michigan.—*Kalamazoo.*—A company is now being formed by Phelps & Bigelow, Smith & Pomeroy, The Williams Manufacturing Company and others to establish a plant for the manufacture of windmills.

Nebraska.—*O'Neill.*—Rock and Brown counties, Nebraska, have organized an irrigation company and propose to tap the Niobrara, Snake and Plum rivers. The ditch will be turned over to the county after the legislature passes the District law. Capital stock \$50,000.

Westcott.—The Westcott Irrigation and Canal Company. It is proposed to construct a ditch along the Middle Loup valley. Capital stock \$30,000.

North Platte.—The South Side Irrigation and Land Company will build reservoirs, canals and ditches and sell water and land for irrigation purposes. Capital stock \$75,000.

Neligh.—The Neligh Irrigation and Power Company. The purpose of the corporation is to tap the Elkhorn river near the Holt county line and convey water through a ditch to the Neligh city limits, where it will be turned back into the river. Capital stock \$100,000.

Sargent.—Middle Loup Valley Irrigation and Canal Company, with principal office at West Union, Custer county. To build and operate main ditches and laterals for irrigation purposes along the Middle Loup river and to furnish water along its line in Blaine, Custer and Bailey counties. E. P. Savage, superintendent. Capital stock \$50,000.

New Mexico.—*Santa Fe.*—The Espanola Irrigation Co. will operate in the Rio Arriba and Santa Fe counties. The directors are Thomas Smith of Las Vegas, Clayton G. Coleman, Thomas J. Helm, T. F. Moore, C. W. Dudrow, R. E. Twitchell of Santa Fe, and Jose Amada Lucero of Espanola.

Oregon.—*Pendleton.*—Maxwell Irrigation Company reported incorporated.

Texas.—*Austin.*—The Horton Deep and Artesian Well Company, Dallas. Incorporators: Thomas F. McInnis and John Hall of Dallas county and S. A. Horton, John M. Mims, H. L. Norris, H. G. Gough and Sam Hocker of Red River county.

Wyoming.—*Sheridan.*—The Colorado Colony Ditch Company. Fred Tyler of Sheridan and J. P. Maxwell of Colorado are interested. It is proposed to build a dam on Cross Creek, a tributary of Little Goose Creek, south of Sheridan, and use the water for irrigating and other purposes.

Wisconsin.—*Milwaukee.*—The Gothenburg Power & Irrigation Company, incorporated by William C. Quarles, George W. Wilson and C. F. Wenz, for the purpose of constructing and operating canals in Nebraska for irrigation and water power, construct and operate dams, reservoirs, etc., power houses and appliances for the transmission and sale of power, and the harvesting and sale of ice. The capital stock is \$150,000.

*Furnished by W. D. Harlan, Washington, D. C.

PUBLISHER'S DEPARTMENT.

CIVILIZING A SECTION OF LAND.

HOW A COLONY OF THIRTY-TWO FAMILIES MAY OBTAIN ALL THE ADVANTAGES OF TOWN LIFE IN THE COUNTRY.

THE experience of the past twenty years has taught us something about the natural laws of settlement in arid countries. One thing that has been learned is the fact that settlement should be undertaken in groups or colonies, rather than by individual families. The peculiar conditions of the arid regions make the colonial policy not only attractive, but almost imperative. This is desirable not only that the benefits of neighborhood associations may be secured, but also that economy may be realized in administering canal systems. Then, too, there is an essential difference in the natural conditions of the humid and the arid region. Isolation was not necessarily an evil on the prairies of Illinois in the early days, because all the problems presented were the old, familiar problems of farming as everywhere known and understood. But farming by irrigation is a new phase of agriculture, and for many reasons it is more successfully undertaken by colonies than by individuals.

SOME MODERN EXAMPLES.

The wise man makes his plans by a study of experience and then improves as much as possible upon his model. Three examples of comparatively modern irrigation development, familiar to all readers of this journal because so often cited, are Greeley, Colo., Riverside, Cal., and the Mormon settlements of Utah. Greeley was founded and developed under the inspiration of the famous editor of the *New York Tribune*. N. C. Meeker was chosen as the leader and he organized a group of colonists. They went together into the valley of the Cache la Poudre in Colorado and began the work of reclaiming the desert. They worked in the true colonial spirit, and quickly developed an industrial policy which has led to wonderful prosperity. Their civic institutions are of the best and their agricultural methods have given the colony a worthy fame.

Riverside is the most famous of the several groups of orange colonies in Southern California. It was founded by Judge North, then of Tennessee, who gathered a group of earnest, hopeful men about him and went out to conquer the desert. They, too, worked in the spirit of the Pilgrim Fathers, who had undertaken to found new institutions in a new land, and Riverside has become the type of its class.

What the Mormons have done in Utah it was only possible to do by groups of families rather than as individuals. There is a certain subtle element in the colony idea that is wholly absent from the plan of individual settlement. There is a unity of purpose, a fellowship and comradeship, a power of association which works out a high order of results. The best possibilities of this spirit have been illustrated where the irrigation canal is the physical bond of union.

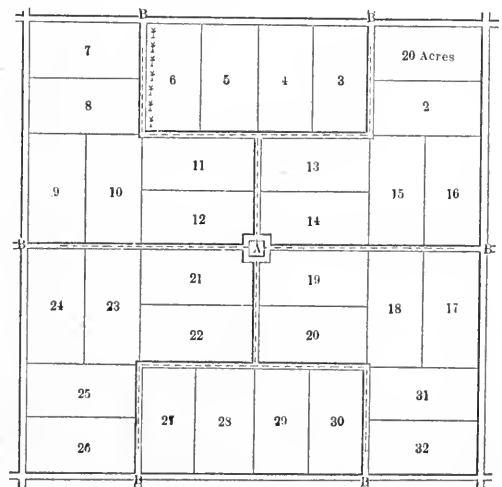
THE COLONIES IN KERN DELTA.

The management of the Kern County Land Company has recognized this principle from the beginning and adopted it as the central idea in its plan of

settlement. It started with the Rosedale colony and followed it with Union Avenue, Mountain View and Lerdo. Rosedale was settled largely with English colonists. The company laid out 12,000 acres in twenty acre farms, made broad avenues, conducted the water to the highest point on each farm, built a commodious hotel, and liberally encouraged the making of schools and churches. That was four years ago. That is a long time in the progressive West, and this company is undertaking to do more for its settlers in 1894 than it did in 1890.

THE VERY LATEST IN COLONIES.

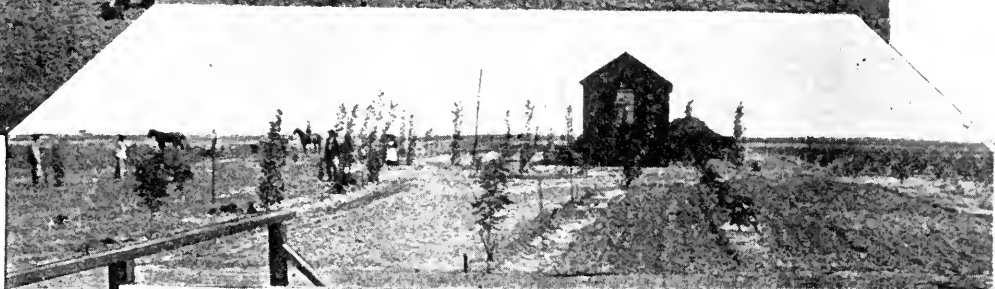
The Kern County Land Company now has a plan which offers remarkable advantages to colonies of thirty-two families. Such a group may select a section of land (640 acres) out of the 400,000 acres under the company's great canal system, and it will be put into attractive condition for settlement. First, the section will be divided into twenty-acre lots. Avenues sixty feet in width and having a total length of a trifle over three miles, will be laid through and across the tract upon a unique plan. Then the exterior lines of the section will be fenced with a prime stock, rabbit-proof fence, made by setting posts eight feet apart, and, beginning at the top, putting thereon two strands of barbed-wire, then a fencing board and wire netting thirty-six inches in width. At each in-



A. Pump plant and tank. B. Automatic gates.
---, Water main.

Stock and rabbit-proof fence on exterior lines. Irrigation ditches as contours require. Trees as indicated, to lie on both sides of all interior avenues.

tersection of an avenue there will be an automatic gate, opening and shutting with the impact of a carriage wheel. The avenues will be seeded to alfalfa



except that part actually needed for driveways, which will be bordered with suitable shade trees.

WATER IN THE SECOND STORY OF HOUSES.

The company will supply water in the central reservation or park, of sufficient depth and dimension to furnish water for live stock and household use of all the families, and will erect at a height sufficient to force the water to the second story of a house upon any part of the section, a tank of sufficient capacity equal to a twenty-four hour supply, and from it, by means of mains laid through the avenues, conduct the water to the front center of every twenty-acre lot upon the section. It will also put in the pumps necessary to force the water from the well to the tank and a steam engine for operating it. It will also construct the ditches required to conduct the water for irrigating purposes to a distributive point upon each twenty-acre lot.

ADVANTAGES TO COLONISTS.

The colonists of Greeley, Riverside and Utah started with no such advantages as this. There is no other company in the world that attempts to do so much for its settlers. There is none, certainly, that would attempt to do so much for so small a group as thirty-two families. But the Kern County Land Company makes no pretense of superior virtue or generosity in formulating these plans. It proposes that the settlers shall themselves pay for these improvements, the cost being added to the price of the land. Nevertheless, the plan is a distinct advantage to colonists. In the first place, it secures a uniformity of high class improvements, which obviously enhances the value of all the property. In the second place, it secures these improvements much more economically than it could be done by individuals. The company can do these things in a wholesale way at least 25 per cent. less than the thirty-two families could do acting separately and by themselves. In view of the large expenditure involved, the company requires 40 per cent. of the purchase price to be paid in cash, the balance remaining as a lien upon the land, drawing 7 per cent. interest. Lands will be sold, when improved as indicated, for \$95 per acre. Of course, it is necessary to organize a colony of thirty-two families in order to take advantage of these plans.

HUNDREDS OF SUCH COLONIES.

A large number of colonies of this sort ought to be formed during the coming winter. In hundreds of American towns and villages there are families of moderate means who ought to take their money out of the savings banks and invest it in such an undertaking. The bread-winning members of these families work for wages in various mercantile and manufacturing industries. The experience of the past eighteen months has taught them how easy it is for matters entirely beyond their own control to diminish their income, or stop it altogether. Then they draw upon the bank account. This resource cannot sustain them long in entire or partial idleness, but it

is a capital sufficient to make them a home in Kern Delta. No man is free except the man who lives under his own roof, and produces from his own acres the things his family consumes. It ought to be easily possible to organize a colony in almost any one of the thrifty towns and villages of the East or Middle West to take advantage of this remarkable opportunity for the making of a group of homes. People who desire to be associated with such a colony, or to undertake the organization of one, should correspond with the Kern County Land Company.

THE DAIRY INDUSTRY.

The phenomenal growth of the irrigation industry in California during the past few years has been chiefly due to the prosperity of the fruit industry. Kern Delta is famous for its peaches and apricots, its pears, prunes and olives, but just at this time diversified farming is attracting the most attention. This is due to the fact that since the panic set in people have begun to realize that it is really more important to make a living than to make a fortune. One of the most promising outgrowths of the study of diversified farming in Kern Delta is the dairy business.

This branch of industry is just now receiving a good deal of attention in the famous dairy district of Elgin, Illinois. In comparing the conditions of Illinois with those in Kern Delta, it has been discovered that in the former three acres of tame hay are required to support a single cow, while in Kern Delta one acre of alfalfa, or Spanish clover, will support two cows. In other words, assuming that land in both places is worth \$75 an acre, it requires \$225 worth of land to support a good milch cow in Illinois, and \$37.50 worth of land to support the same cow in California. California has the advantage of the long seasons, where there is practically no winter, so that it costs much less to house cows than in Illinois. The market is good and the advantages are quite in favor of the Kern Delta as a field for the dairy industry. This is a very attractive branch of farming and one that settlers in these new colonies may very profitably engage in.

AN ALL-ROUND COUNTRY.

But the Kern Delta is a good all-round country. It is famous as an alfalfa producer and feeding ground for sheep, cattle and horses. It has made an enviable record in recent years in the production of all the fruits—peaches, apricots, prunes, figs, olives, pears, etc. Its vegetables and small fruits, cereals and grasses are unsurpassed. Its rich soil, abundant water supply and winterless climate furnish all desirable natural conditions for every branch of diversified farming. The company's beautiful literature describes and illustrates the advantages of the country, and answers all questions that arise in the mind of the home-seeker. Address: S. W. FERGUSSON, Manager, Bakersfield, Cal.

NEW YORK: 812 Bennett Bldg., Fulton St.
CHICAGO: 918 Chamber of Commerce Bldg., Cor. Washington and La Salle Sts.

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THE IRRIGATION AGE.

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THE PROGRESS OF WESTERN AMERICA.

The Colonist is the Foundation. It is high time that the influences engaged in the making of Arid America assumed a new direction. Heretofore

most of our literature and all of our public appropriations have been devoted to the engineering aspect of irrigation, while nearly all the missionary work in the East and abroad has been directed to the investment side of the subject. This was natural and proper enough at the beginning of our development. Irrigation works could not be built without the knowledge of physical conditions which the engineer supplies, nor without capital. But the time has come when the engineer and the capitalist realize that another factor is the foundation of all prosperity on arid lands. And this factor is the colonist. It is for his benefit that all skill and capital have been expended, and it is by his presence that new demands will arise for the services of the engineer and new opportunities be opened for profitable investment. The lack of the colonist is almost alone responsible for the disappointments which have attended irrigation investment. The great Arid America of which we dream—the field where a new civilization may be erected and where popular institutions may be invigorated and perpetuated—can only be made by tens of thousands of men who shall develop industry and create homes on the reclaimed desert. And we have reached the stage in our progress when the best thought and the sturdiest effort should be devoted to the work of peopling the lands under ditch, and thus making an insistent demand for the reclamation of the millions of acres which now lie waste. The whole future of the arid region, improved and unimproved, is comprehended in the word colonization. This involves not merely the millions already invested in irrigation, but also the destinies of States and the future of national expansion.

Typical Colony Proposed.

Considerable space in this department of THE IRRIGATION AGE has been devoted to this subject during the present year. We have persistently sought to arouse interest in the necessity of developing colonies of the best kind. More than once we have hinted that the subject of a typical colony was under consideration at the hands of men prominent in the irrigation movement. We are now happy to announce that these plans are taking shape, and that there seems to be a good prospect that a notable achievement will be recorded during the first half of 1895. It is desired to make a colony that will illustrate the best possibilities of home-making on irrigated lands. The thing aimed at is to develop a scheme of prosperity for the average man. The difficulty in formulating plans has been to find the calm sea level of common sense in a mass of suggestions, all more or less colored with Utopian tints. None of the many minds consulted have doubted the possibility of making an improvement on our present industrial and social conditions, but several have been inclined to insist on having the millennium at once. Those in control of the matter, however, while insisting upon progress, have insisted also upon conservatism. Thus the new undertaking is in no danger of revolutionizing society, though it is believed that it will present many features that will be regarded as exceedingly hopeful and full of promise of better average conditions for men who earn their bread in the sweat of their faces.

For the Public Benefit.

The proposed colonial undertaking, of course, is no sense a private or speculative affair. If such were the case it could not be presented in this place, nor could it hope to exert a far-reaching influence upon the future of Arid America. If the projectors of the enterprise had been willing to make the effort on the

lands of any of several great land companies, and to accept the financial backing of such companies for the work, the undertaking might have been launched long ago. But it would have been impossible to obtain public confidence under such conditions. The effort would have been construed as an elaborate advertisement and men of reputation could not afford to lend their names to it unless it were frankly avowed to be a purely private enterprise, in no sense related to the general movement. The new colony will be made in a locality where it has been possible to buy up several thousand acres of land, with water-rights from a group of individuals who had acquired titles from the government in the natural way. The financial backing has been obtained on the personal responsibility of the projectors of the movement. There will be no attempt to realize profits, but those who give their time to the matter will be fairly well paid for their services, while the real profits of the enterprise will be invested in making improvements and creating industries for the benefit of the settlers. If the enterprise be as thoroughly successful as hoped, it will be valuable not only to the country as a whole, but to every valley, every community and every land company in the arid West. It will attract a degree of public attention which could not possibly be obtained for any private enterprise. It will stand as a great object lesson worthy to be imitated everywhere. It will be a gleaming beacon light, pointing the way to prosperity for millions. It will mark the laying of the corner stone in the industrial system of the future. This is the spirit in which it is undertaken, and in which it will be carried out. The very name it will bear is a name sacred to liberty in the annals of Anglo-Saxon men.

**The
Colonial
Principle.**

The first lesson which it is hoped to teach for the benefit of the West as a whole is that settlement can be best accomplished by reliance upon the true colonial method and spirit. That is, by settling people in groups, or colonies, instead of settling them as individual families. Those who have given most study to the subject are convinced that this must be adopted as a fundamental principle in the colonization of arid lands. Natural conditions make this quite imperative in cases where the highest results in community-making are sought. The principle is by no means a new one. It was adopted by the English, the Dutch and the Huguenots in founding their settlements on the Atlantic seaboard. It was also the plan adopted in making the most successful settlements of the past fifty years on arid lands. The first reason for the choice of this method is a physical one. The economical distribution of water and management of canals demand compact settlements. Many a company has been involved in severe and needless ex-

penses by diffusing a few settlers over a wide area. But there are better and higher reasons founded on social, industrial and ethical considerations. In the development of communities in new countries, perhaps even more than in the movement of armies, it is essential that there should be *esprit de corps*. There must be enthusiasm for a common purpose. There must be fellowship. There must be something of that sublime inspiration which bears men up, even in the face of danger and hardship, when engaged in the task of making new institutions. These qualities are impossible under a policy of individual settlement. But these qualities are indispensable to the realization of very high results. The plan to make a colony founded on lofty ideals has never yet failed of popular interest and support when presented under auspices that commanded general confidence.

One of the most interesting books ever published in the West is Hon. David Boyd's "*Greeley and the Union Colony of Colorado*." The projectors of this new undertaking have studied Mr. Boyd's book with profound attention. Greeley was undertaken in precisely the spirit we have described as essential to high results. It was first presented to the public twenty-five years ago the present month through a modest announcement in the *New York Tribune*. Mr. Meeker, the father of the project, appealed to the common human instinct for a home and independence. He sought also to evolve improvements over the ordinary way of living. He had been a disciple of Fourier, an earlier Bellamy, and had lived in one of the ill-fated communities patterned on the model advocated by that brilliant but impracticable philosopher. Mr. Meeker had trimmed down his ideas of the millennium very considerably before he projected Greeley, but there was enough of it left to make his announcement very attractive. More than 1,000 people replied very promptly to the letter in the *Tribune* and the first meeting of intending colonists adjourned from the newspaper office to Cooper Institute to find room for its deliberations. This was a quarter century ago, when Colorado was relatively as distant as Korea is to-day, and yet not less than 350 people enrolled themselves as members of Union Colony, paying \$155 in cash as their first subscription to the common fund. Horace Greeley addressed them and warmly endorsed irrigation and the colonial policy. Very many lessons may be learned from Mr. Boyd's fascinating history of Greeley, but the one we are directing attention to here is the fact that the organization of a large party of colonists, bent on the purpose of facing the frontier together and developing better conditions for common prosperity, was the winning policy then, as it will be hereafter. The same principle was illustrated by Brigham Young in



WILLIAM H. PHIPPS,
Land Commissioner of the Northern Pacific R. R.

founding Utah and by Judge North and his friends in founding Riverside. There are many other instances which furnish proof of the same sort. The principle is one which has its foundations deep down in human nature, and it is hoped that the typical colony now projected will do more than any of its predecessors, to fix this principle as one of fundamental importance in the making of Arid America.

The small farm unit will be another feature of the new undertaking. In spite of the fact that all experience points to the small farm as the basis of the best average prosperity, men were found in the last Irrigation Congress to defend the Desert Land law on the ground that 320 acres of arid lands were barely sufficient to sustain a family. And yet a careful study of any valley now occupied in the arid region will disclose the striking fact that the farmer who is cultivating intensely a small acreage is making more money, year in and year out, than his neighbors who cultivate several times as much land. Not only this, but in Utah the experience of a whole people, over a period of twoscore years, demonstrates that the small farm is best. In the proposed colony, which will be located where the average conditions of soil, climate and altitude prevail, the farm unit advocated by the

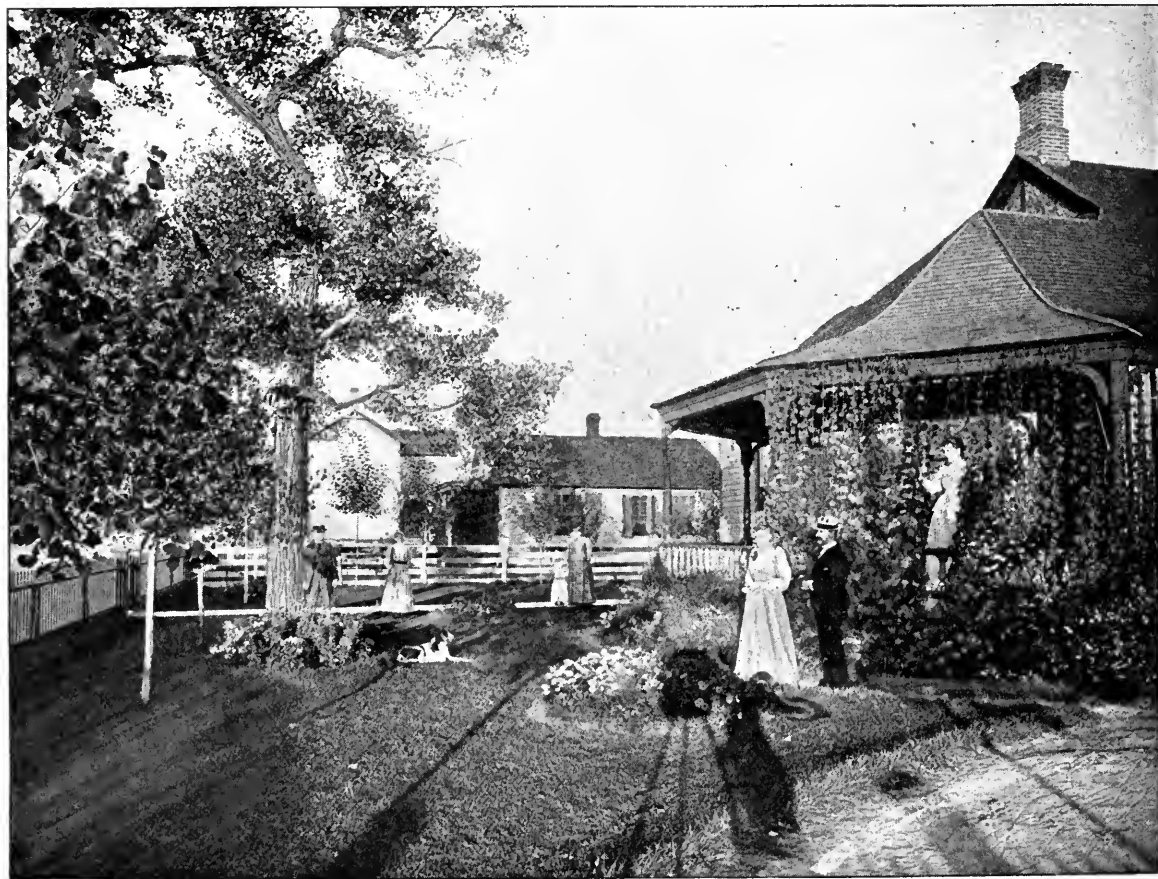
projectors will be twenty acres and no one person will be permitted to buy at first hands more than forty acres. It is believed that nearly all the colonists will prefer the smaller unit. The foundation principle of the new colony will be diversified production, approaching to the nearest practicable point of producing absolutely what the family consumes. Beyond this it is proposed to produce on each farm a wisely chosen surplus. And an Advisory Board, consisting of about twenty prominent citizens of the arid region, is busily engaged in working out all the details of these features of the plan. Colonists will have an opportunity to study fully a dozen diagrams of diversified farms, each representing the best thought and experience of practical men in the West. There is certainly reason to hope that the plan of the intensely cultivated small farm will be brought to a higher perfection by this method than has ever been done before. When these plans are fully matured they will be freely given to the public, and thus be available for colonies elsewhere. If they are generally adopted, with the result of giving a great impulse to the settlement of irrigated lands everywhere and to the outworking of new and better forms of prosperity for average people, the highest wish of the projectors will have been realized.



SENATOR A. L. BABCOCK,
Of Montana.

A living guaranteed by the principle of *New Forms* self-sustenance, and at least the hope of *Social Life*, a competence furnished by the systematic production of a surplus, the next great desideratum will be the social life of the new colony. The leading feature under this head will be a village site at the most accessible point in the midst of the colony tract. Each purchaser of a farm will be given an ample lot—probably an acre—in this village, provided he will agree to build his home and

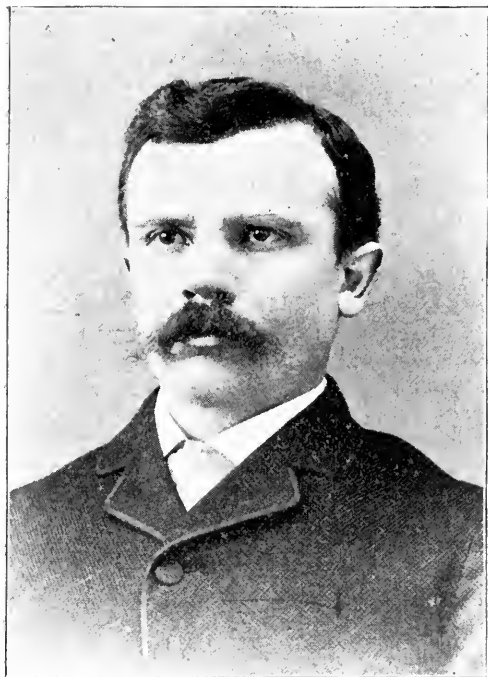
has been successfully realized in Europe, and the Mormons in Utah have used it very effectively for forty years. In the writer's judgment the farm village, when brought to the highest development, is destined to do more than all other causes combined to attract a very desirable class of population from Eastern cities and towns to the arid lands. The isolation of country life, and the lack of companionship it involved, has been the prime cause of the somewhat alarming movement of population out of the country



A TYPICAL GARDEN HOME IN THE ARID REGION.—By courtesy of *Northwest Magazine*.

live there. From the center of the village to the farthest outlying farm will be less than three miles. The school, postoffice, stores and public library will be located in the park in the center of the village. The entire tract will be improved with roads and boulevards, lined with shade trees. In this programme we have the bare skeleton of a most charming social life, which shall combine the best features of town and country. Of course this is not a new idea. It

and into the great cities. The farm village plan will supply neighbors, while the public library, especially if combined with a public hall suitable for entertainments, will supply the best advantages of town life. We realize, of course, that this system must be more highly developed than has yet been done to bring the best results. But it is a system which contains the germ of enormous possibilities for good.



HON. CHRISTIAN YEGEN,
Of Montana.

public building with a good library, and then to the erection and equipment of several small industrial plants, as for instance a creamery and a canning factory. This will furnish a profitable outlet for the surplus products of the farm. All our arid States are now importing dairy, poultry and pork products as well as canned goods and many other household necessities. The raw material of all these necessities is produced on the farms, but the people have failed to organize industry, that this material might be manufactured, and then they have failed to organize markets for their profitable sale. It is hoped to demonstrate how this can be done through the organization of colonies, the capital being furnished by the settlers themselves, by means of paying a little higher price for their land. These industrial plants, like the public library, parks, roads and other public property, will belong to the colony, the purchaser of each farm acquiring a certain amount of the capital stock, but there will be no attempt at coöperative management. The plants will be leased to individuals of experience in their several branches, and they must operate them entirely upon their own capital. The fact that they can get a completely equipped plant at a moderate rental on a long lease, that the production of the raw material they require is guaranteed by the presence of the colonists, and that ample home mar-

**Organizing
Industry.**

None of the features of the new colony thus far enumerated are really new. The Mormons have practiced the principle of agricultural independence and prospered amazingly. The Greeley colonists have realized the best possibilities of the surplus crop and of a high type of civic institutions. In Southern California the proprietors of small irrigated farms have shown us about the best that can be done in the way of beautifying homes and their surroundings. It is hoped that the new colony will combine these various features more effectively than has ever been done before and improve upon them to a considerable degree, but there is one feature in which the new plans are apparently original. It is a feature of the highest consequence, and one which, if successfully carried out, and copied elsewhere, will contribute vastly to prosperity in the arid regions. It is proposed to put a price on the lands of the colony which will realize a net profit of about \$50,000 above the cost of organizing and advertising, laying out the village site, making roads, lateral ditches and other necessary improvements. This can be done without raising the price per acre above the average of the best land in the arid region. This surplus of \$50,000, which would ordinarily go to the account of profits, will in this instance be devoted to the erection of an attractive



HENRY W. ROWLEY,
Of Montana.



E. H. BECKER,

Publisher of the *Gazette*, Billings, Montana.

kets are close at hand, will certainly make it easy to obtain the kind of ability required. If the plan works out successfully every community in the arid region where lands are for sale will adopt it in the end, for it will be the surest means of guaranteeing prosperity to the settlers and furnishing a self-sustaining population for the town. By the way, there will be no speculation in town lots. That portion of the village site not required for the farmers' homes will belong to the colony, and the proceeds arising from its sale will be available for further improvements.

**The
Result
Desired.**

It is believed that when these plans are perfected and announced they will attract the widest public attention. Already the projectors have received assurances of support from many influential men in eastern States. The matter is undertaken to illustrate the possibilities of home-making on arid lands. The success of the project must certainly result in making all good irrigated lands in lively demand. This is desirable, but it is not the most desirable thing it is hoped to achieve. The great end is to attract the attention of the American people to the splendid outlet for idle energies and idle capital which is offered by Arid America. The object over and above all other

objects is to found new forms of civilization, of which industrial independence and a reasonable equality in the ownership of the soil shall be the broad and enduring base. Such other general facts as promise to be of benefit to the readers of *THE AGE* will be published from time to time, in order that the ideas and experience of the practical and enthusiastic men engaged in the work may be available for use throughout the West.

The irrigation convention held at Hutchinson, Kansas, November 23 and 24 was a remarkable event. The attendance was large throughout, and at one time 3,000 people were in attendance. Probably this is the largest number ever gathered in this country to listen to the discussion of irrigation. The programme was also extraordinary because of the number of practical topics discussed. There were not less than fifty subjects and fifty speakers, and at least forty-five of them dealt with downright practical subjects of interest to the man dealing with the problem of putting water upon his land. This convention marks the high tide of irrigation interest in the semi-arid region. It is the most significant thing in Kansas history since the tumultuous times when it emerged from civil conflict as a free State. It means the beginning of a mighty effort looking to the transformation of the drouth-stricken western half of Kansas into a garden whose extent will be limited only by the available water supply. A great effort will be made to provide the State with an engineering department at the approaching session of the legislature. If this is accomplished the irrigation movement in Kansas will go forward to the achievement of great results. The Nebraska State convention will be held at Kearney, December 18 and 19, and this promises also to be a very successful event.

The session of the Trans-Mississippi Congress at St. Louis November 26-30 accorded special honor to the subject of irrigation, putting it first on the programme, before silver, the Nicaragua Canal and all other topics. Mr. Newell presented a clear and interesting discussion of the water supply, and Mr. Mead delivered a very able address on the land laws and pointed out the manner in which the Carey law can be utilized. The chairman of the National Irrigation Committee discussed "Irrigation as a Living National Issue." The speeches were quite fully reported in the press throughout the country, and it is generally felt that the cause was effectively pushed to the front. The Congress again demanded the cession of all non-mineral lands to the States and Territories. There was no demand for this action on the part of those who formerly led the movement for cession, but the sentiment of the West seems to be

so clearly in this direction that it is impossible to suppress it. Like Barnaby's famous cork leg, it is so effectively wound up that it keeps going on, in spite of the fact that those who have been its best friends are quite content to patiently await the outcome of the Carey law.

What Will the Legislatures Do? The time is fast approaching when our western legislatures must deal with the splendid opportunities offered by the Carey law. The manner in which they deal with it will determine the future irrigation policy of the nation. If it shall be proven that the western people have sufficient intelligence and civic virtue to deal wisely and honestly with a million acres, it is altogether probable that they will be given dominion over the vast public domain. If the nation is disappointed in the outcome of this legislation, no farther power will be intrusted to the West. An important movement is now on foot looking to the utilization of the Carey law in a very striking way. If anything comes of it the matter will be fully presented in an early number of THE AGE.

A Chance for Nevada. The people of Nevada have good reason to hope for an unusual amount of good from their incoming State administration. Hon. John E. Jones, the Governor-elect, is a statesman who understands the rela-

tion of water and land to the future of Nevada. He served most acceptably as member of the National Irrigation Committee and chairman of Nevada's State Commission. His canvass of the public opinion of the State and his report to the last Irrigation Congress demonstrated both his ability and his enthusiasm. If he now directs his influence as governor to the development of a life policy of reclamation and development he will do more for Nevada than any previous governor has been able to accomplish. Nevada is a State of magnificent resources. It has been kept down by the greed and avarice of a corporation, by selfish politicians and by the demoralization introduced by the Comstock's era of riotous prosperity. What it needs now is a thorough exploitation of its irrigation possibilities, a careful revision of its irrigation laws, the development of a few good canal systems and then the making of one or two such colonies as have already been described in this number of THE AGE. On such industrial lines as these Nevada can sustain thousands of prosperous families. Nevada's day will come. It will yet take a proud place in the sisterhood of States. It is our earnest hope, as well as belief, that Governor John E. Jones will turn the tide for Nevada. All his fellow citizens should resolve to stand by him and help him carry out an aggressive policy of this kind.



CROW INDIANS HAVING A WATERMELON FEAST AT THE YELLOWSTONE COUNTY FAIR.

IRRIGATION PRINCIPLES.*

II. ASSOCIATION.—IRRIGATION DISTRICTS.

BY WM. HAM. HALL, MEM. AM. SOC. C. E.

THE idea of association in the development of irrigation industry naturally follows upon that of the common ownership of waters. Just as administrative control of streams and regulation of diversions therefrom has been erected as the framework of water-rights systems in civil law countries, so has the local association of irrigators for the control and promotion of irrigation development within unified areas (districts) of the common ownership of waters, been made the foundation of laws and regulations intended to foster and encourage irrigation enterprise.

The three ideas, logically, are bound together. Action upon them, rationally, must be harmonious. The waters belong, in common, to all the people. As a common property, in which all have an interest, they must be protected from unlicensed or unregulated taking by any. The government is the natural guardian of the people's stock of common property. As a common property the local use of waters should be in the hands of those of their owners who can to advantage be associated together at any locality for such use. If there ever was a reason for making waters a common property of the people, there is equally a reason for making their use a communal use, and their control a community control in such use. There is no reason, in the public interest, for suffering the control of the common property necessary for the community use to go into private hands. There are the best possible reasons why the people should associate, locally, and exercise that control. Such is the civil law logic.

How different the outcome of the other fundamental principle—that of the common law: The argument is that waters are public property, and are an integral part of streams. The people have no proprietary interest in them, except as part of streams, and except, indirectly, as they, the people, constitute the public. Riparian proprietors have a usufructuary right in streams: they own the land enclosing them; are, more than any others, interested in their preservation; and, hence, are their natural guardians. The government ought not to interfere with the natural rights of riparian proprietors by attempting to administer streams. If those who have the most interest in streams—the riparian proprietors—do not object in the courts, waters, being of that species of public property which may be appropriated to private possession and control, may be taken out of streams by any one who has the money and the enterprise so to do. There may be associations of irrigators for this purpose, but that is a point of private desire or taste. The public welfare is in no way concerned. The public's interest is in the streams. If waters may be removed from them at all, the public's interest in those waters ceases. The people at large have no interest in the waters separate from the streams. From the public standpoint, what matters it under what organization waters are used, so long as they are usefully employed? What fundamental reason is there for prescribing conditions, forms of control, or getting up local organizations for using water appropriated, taken away, from a stream? The people to be served in irrigation have no primary right to the waters. Their interest in them was indirect, through the body politic, the public; and this interest in them was as part of the

stream, and not in them as waters—a separate, common property. The waters are public property subject to appropriation. Let him who appropriates them use them. To all intents and purposes they are his. Such is the common law logic.

Under the civil law principle of the common ownership of waters as a separate property from streams, there is, fundamentally, a reason for administrative control of streams as the reservoirs of this common stock, and for the local association of irrigators for control of utilization thereof, when removed from the streams of any locality. Under the common law principles of public ownership of streams and waters, in one, and private rights in streams, this fundamental reason for the presence of these two corner stones of good irrigation system is absent; and so they themselves are left out. It is only when the abuses, which their absence permits, show themselves, that the people of common law countries awaken to the public necessity and demand the civil law institutions of stream protection and association for control of water utilizations. This is not alone the case with respect to irrigation, but to every interest and industry affecting streams or affected by their waters.

The civil law principles of common ownership of waters by the people and local association to control their use, come from the Roman communal idea of settlement and local management of industrial affairs in the interest of the community. The antagonistic principle which shapes the common law doctrine of streams and waters, comes from the feudal system of local government by petty lords—in each neighborhood all the people being his vassals, all the land and water, his fief. To him has now succeeded the "public"—that indefinite being which needs no protection of its interests in its own estimation until after it has been robbed of its rights.

The Roman communal system of town organization, as an institution, was developed in the course of the colonization of new provinces. It embodied the germs of the modern district or association, in that it provided for the local administration of community property, or property held in common for all the people of the settlement. Such were the waters of streams and irrigation ditches and other works. All of southern Europe, including Spain and southern France as well as Italy, received this system under Roman rule. But the feudal system succeeding it, was antagonistic to this communal form of organization and property holding, and, later, spreading throughout those countries, most everywhere swept away the community properties of the towns and the Roman form of town (district) government. In Spain, however, notwithstanding the supremacy of the Goths and the subsequent long occupation of the country by the Moors, the communal right, especially as applied to irrigation works and waters, survived, and following Spanish precedents and examples came the more modern forms of community organization as applied to irrigation districts in other countries.

IRRIGATION COMMUNITIES IN SPAIN.

Spain is the country *par excellence* of association in irrigation. By far the greater area of irrigation and number of irrigation works in that country have been under control of associations of small landowners

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and irrigators for centuries. The Spanish governmental policy contemplates the joining of waters of all streams not strictly private because of their diminutiveness to the lands they irrigate, and their management by the landowners organized into communities. The law provides that wherever an area exceeding 200 hectares (494 acres) and belonging to twenty or more persons, is served under one water privilege, a community or district shall be formed, according to the principles and regulations laid down. Thus, not only in the case of new enterprises, but for old ones as well, these associations are compulsory, and the law directs that the Governor of the province shall take steps to force their formation and compliance with the law, if the people do not voluntarily move in the matter. An association is thus made compulsory in every case so that questions which might give rise to dispute, and all relations of interested parties may once for all be adjusted in advance, to protect the common interest and promote public welfare.

Each such association is empowered to fix the qualifications of its electors. The law provides that at the election held at times of organization, the voting shall be done according to area of lands which each participant represents, notwithstanding all parties have an equal voice in the proceedings. This provision would seem to put the stamp of land voting, only, permanently on all associations; but the practice results in a compromise very similar to that found in the law under the French system hereafter described.

Where districts are authorized to contract a fixed indebtedness or to incur obligations to pay for waters furnished by concessionaire companies, as is the case in a number of the more recent enterprises, the government reserves the right of enforcing the payment of taxes and water rates. Thus it protects the outside investor, just as it has protected the district and the irrigators by fixing in the concession the maximum water rates which may be charged, the amount and manner of serving water, and the provision that the works and water rights are at the close of the term of concession to become the property of the district.

The Spanish system goes further still in application of the principles of local self-government in irrigation. It sets up special water courts in irrigation districts—whose members are irrigators elected by the people by manhood suffrage—to determine all petty questions arising out of the practice of irrigation among irrigators. And, finally, it provides for the federation of irrigation districts or communities deriving water supply from any one common source, and delegates to each such general association the control of diversions from the stream within its jurisdiction, subject only to general regulations and supervision by and appeal to the governmental or provincial irrigation authorities.

The topographical conditions in the irrigation quarters of Spain were such as to admit of canals being taken out of streams and maintained and operated by community labor and without the necessary employment of capital in large sums, and in this fact do we find a physical reason for the adherence through centuries of feudal and Moorish rule, to the community principle in irrigation enterprise.

FRENCH IRRIGATION SYNDICATES.

The French system of association has these points: The codified general law of France contents itself with exacting general principles relative to water

rights and associations in general. Special laws and departmental decrees authorize the formation of associations or syndicates of land owners for a number of purposes, among which is irrigation, and prescribe forms of organization, etc.

"The general organization of associations is the same for all the purposes specified, but the details of agreement and administration differ with the object in view. * * * The law recognizes two kinds of syndicate associations: The first, called 'free,' because held together only by the expressed will of the members; and the second called 'authorized' because specially declared, in each case, to constitute an organization of public utility, and so 'authorized' to exercise the right of eminent domain in condemning private property for the purpose of the association."

"These societies are formed upon the basis of the land to be beneficially affected by the works contemplated; representation and voting power in the general assembly of subscribers being proportioned somewhat to the area held, varying in different cases, within prescribed bounds, according to circumstances and as determined and settled in the constitution or articles of agreement of the society. Their boards of directors called *syndics*, constitute the *syndicate*, proper, although the whole association is frequently called a syndicate. Being legally constituted bodies, they can enter into court, acquire or dispose of, exchange or hypothecate property, and do all that an individual may do in a business way." (*Irrigation Development*, p. 150.)

Every association of this character, whether "free" or "authorized" officially, must be registered, and becomes a known and definite factor of local development. The terms of association may differ as to details in different cases, but the principles in all remain the same. Landownership is the qualification for voting. Owners of land in the district, or their representatives, alone have the ballot in the syndicate or district elections. They alone determine whether the district shall contract a debt, and elect the officers to levy and collect its taxes, disburse its funds, and manage its affairs. The voting power is always arranged, however, so as to give small landowners a voice not only in full proportion to the area of their holdings, but as due also to the simple fact of their being landowners. Thus, generally, the voting unit is the small farm of five hectares (12.35 acres); but every owner of land of less area, down to one hectare, has equally a vote, while owners of greater area add votes only by one for each additional five hectares owned.

All associations are first formed as "free" syndicates, and those which desire to be recognized as of public utility, and be "authorized" to exercise the right of eminent domain, are made so only after having their entire project examined and approved by the irrigation authorities of the department (or state) in which situated. "In the case of authorized associations the government in a measure becomes accountable for the meeting of their engagements, so that the assessments are not only collectable as taxes by the officers of the syndicate, but the government authorities, if necessary, may interfere and force their collection so as to make good the debts of the district."—(*Irrigation Development*.)

In granting water rights to landowners for the irrigation of their lands, where more than five persons are the beneficiaries, the government insists that a

syndicate or association be formed, and to it the grant is made. By this means subsequent conflict with other water right holders and dissension among the grantees themselves is cut off; for, in the formation of the syndicate and fixing its water rights all points of probable conflict have to be settled and recorded.

In granting irrigation water rights to a speculative company the government insists that the owners of the lands to be irrigated shall first be formed into a district syndicate, and then this association is made a party to the water right concession, in such manner that its relations to the company which is to build the works are thoroughly established, and always with the condition that after the life of the concession to the company (twenty-five to fifty years) the works and water rights become the property of the syndicate or district. It is in this class of cases, especially, wherein the government reserves the right

to enforce the collection of district taxes, in order to make good the payments due to the water-supplying company. Thus the rights of all parties are protected.

The principle of association was early recognized in the irrigation development of France, and its application has prevented the growth of many evils such as have attained overshadowing magnitude in the older irrigation country of Italy. Very large works of irrigation and extensive irrigation enterprises are for the most part of comparatively recent dating in France, although innumerable small neighborhood ditches and irrigations have existed for centuries. The topography of the country admitted of small works being carried out by riparian proprietors and other small landowners near to streams.

[TO BE CONTINUED.]

HOME MAKING IN IDAHO UNDER THE CAREY LAW.

BY D. W. ROSS.

THE man whom we most admire and respect is he who claims every hour of sunshine, every drop of rain and dew, who smiles back on budding nature in springtime and with parental pride lays up the fruits of his labor in the autumn, who plants trees to shelter his children's children, who feels that his labor is duty and his abiding place is home.

He is the man whom we trust, the man who supports the State, who casts an honest ballot, and the first to buckle on the sword of defense for his native land.

The truest soldier is he who fights to save his home and country.

The wisest and best Statesman is he who labors to the end of making his State prosperous and her people self-supporting and happy.

A new commonwealth is like the individual, it can be made or ruined in the spring of life. In its early days it requires developing as well as ruling, and at no time during its life does it call for as wise Statesmanship as when its history is yet to be made.

Twice blessed are they who in enacting laws for the development of a young commonwealth look ahead of their own generation.

THE CAREY LAW AND IDAHO.

Near the close of the last session of Congress a bill was passed now known as the Carey Land Law, giving in trust to each of the arid States one million acres of irrigable, public land, to be reclaimed under the auspices of the respective States and sold to the actual settler. Thus by the provisions of this bill Idaho has been given the opportunity of reclaiming according to her own plans enough land for twenty-five thousand homes, or one hundred and twenty-five thousand people.

Not a dollar need be sacrificed, not an hour's sleep lost in transforming this arid desert into a garden spot, in doubling the population of the State and adding to the general wealth an incalculable amount. Estimating the cost of reclaiming the million acres at \$7.00 per acre, we will have expended for construction of dams, canals, etc., \$7,000,000 in cash, furnishing employment for thousands of people at a time when they will most need it. Putting the land on the market at a price which will pay for reclamation and

carrying charges until each canal is in good running order and self-supporting, we will have land for homes within the reach of thousands of the most desirable settlers, viz: those with a surplus of from \$500 to \$2,000 each.

Making the farm unit forty acres, and many expert irrigators would put it at half that, and assuming that each family at the end of two years' settlement will have made its home worth \$1,000, we have added the enormous amount of \$25,000,000 to the value of the State in farm property alone.

METHOD OF PROCEDURE.

Before Idaho has any rights under this Act, maps must be filed with the Secretary of the Interior showing lands to be reclaimed, method of reclamation, water supply, etc., such plan of contemplated irrigation to be sufficient to thoroughly irrigate and reclaim said land for agricultural purposes. Then the Secretary of the Interior may make necessary regulations for the reservation of the lands applied for by the State to date from the date of filing of the map and plan of irrigation, but such reservation shall be of no force whatever if such map and plan of irrigation shall not be approved.

The State is authorized to make all necessary contracts to cause the selected lands to be reclaimed and to induce their settlement and cultivation. As fast as lands are reclaimed and occupied by actual settlers, patents will be issued to the State or its assigns for lands so reclaimed and settled. It is also provided that the State shall not sell or dispose of more than 160 acres of said land to any one person, and any surplus money derived from sale of said lands in excess of the cost of their reclamation shall be applied to the reclamation of other desert lands in the State.

By the provisions of the Act a great body of land may be segregated from the public domain and the State empowered to make contracts for its reclamation and settlement. This plan has many advantages, and one of the greatest and most lasting will be that the districts thus reclaimed will be natural hydrographic districts resulting in their reclamation at the least-possible cost and the work of administration may be carried on without con-

flict with any other district. Large capital will be required to reclaim such a tract before any of it is ready for settlement, but at a price based upon the cost of reclamation, the land will be eagerly sought by the actual settler, thousands of whom will pay for their homes in labor on the canals.

EVILS OF PRESENT SYSTEM.

The great drawback to Idaho's irrigation enterprises has been the lack of adequate security back of bonds, and another discouraging feature is the lack of skillful cultivators under the canals after they have been constructed. This came about through the securing of large bodies of public lands under the Desert and other land acts by a class of speculators, with the result that though water has been available in many favored places for from two to eight years, only about eight per cent. of the land is now cultivated and the anticipated revenue of many of the irrigation companies is still in the future.

By adopting the right policy the State may secure the rapid settlement, in small tracts, of these large selections which would soon lead to the cultivation of the whole, thereby adding enormously to the public wealth, a policy which our now irrigated districts would be obliged to follow in order to keep up in the race.

The Oregon Short Line Ry. traverses the arid portion of this State, the great Snake River Valley, from east to west, a distance of nearly 400 miles; and it is along the line of this railroad that these selections will necessarily be made.

THE SNAKE RIVER DESERT.

The Great Snake River Desert, as it has been called, presents very interesting features to the irrigation engineer. Standing at Idaho Falls, on the north side of the great Snake river, the country, to the casual observer, shows every advantage of being easily reclaimed, and the *casual observer* has been reporting on the magnificent extent of the irrigable portions of this great region for the past five years. It has been variously estimated to embrace from 3,000,000 to 7,000,000 acres of irrigable land. We find, upon examination, that the great lava fields along the north side of the river extend on low levels to within a few miles of it in many places, and at several points great dykes of lava cross the valley from north to south, which at one time dammed the river, forming lakes above, but through which it cut a way, rushing now at the bottom of black canyons, plunging over falls, Niagaras in grandeur, and always a little below advantageous points of diversion.

The country drops off after each succeeding dyke, dividing what is apparently one great plain into several large basins, each presenting an interesting study to the engineer, as each will require separate investigation in order to determine the best and most economic plan for its reclamation.

The writer was interested in running about 250 miles of trial line for canals between the Idaho and Shoshone Falls, and from information derived from these surveys will say that the irrigable portion of this great valley is not over one-quarter as large as has been represented, and if the State makes wise selections in it, under the Carey Law, but little of it will be left to be reclaimed during our generation.

HERE ARE SOME ANOMALIES:

Idaho has to-day a little over 100,000 inhabitants. She has enough land under ditch to support three times that number, yet more than one-half the food

consumed within the State is shipped from places hundreds of miles away.

The farmer pays transportation on his hogs to Portland, Ore., and the groceryman pays transportation on his hams and bacon from Omaha. The sheep man ships his wool to New York, and the clothier ships his clothing from New York. The fruit-grower ships his prunes and apples as far east as the Missouri River, and the merchant ships canned goods from California, thus adding about one-fifth to the cost of living, through railroad transportation alone.

Idaho stands almost at the head of the list of States as producer of fruits of fine quality. Her mountains are but half prospected, yet she is one of the greatest producers of the precious metals. She has all the resources of nature in great abundance. Her natural products are diversified enough that instead of standing dependent on the enterprise of distant States she should grow up self-supporting and independent.

The Snake river promises grand things from this very source. Heading in the grandest scenery on the Continent, amidst the snow-clad mountains of the Yellowstone Park, where a thousand little streams empty into the great river the treasure of a Monte Cristo, westward, across the State, it winds for nearly 400 miles like a band of silver. The setting in places is beautiful, in places it is rugged in the extreme.

As stated above, this valley is crossed by lava dykes. Over these obstructions the great river dashes down hundreds of feet into the carved channel below. Here some day will be the great workshops of the Northwest. Here, without the asking, has been placed for the use of the people of this State a great treasure worth millions of dollars. From morn to eve, from summer to summer from age to age, a giant force is spent, terrible when uncontrolled, but harnessed, can be made to do the work of half a million horses.

RESERVE THE WATER POWERS.

By this power every town and mine in Southern Idaho might be lighted, every pound of ore crushed, the wheels of transportation moved, and lathes, spindles and hammers driven for millions of people.

These great water powers should be reserved, or at least guarded, by the State, and not be allowed to fall into the hands of impecunious and irresponsible speculators.

It is in the vicinity of these great power sites that the State may make selections under the Carey law. But little interest has been manifested in this important matter. Perhaps it is because the bill was passed as an amendment to what might have been considered a more important bill, and as a result its existence is but little known.

The next legislature of Idaho, which meets in a month, will be called upon to decide on the most advantageous policy under which to proceed in order that the State may derive the greatest advantage from the Carey law. The successful carrying out of such a policy means the construction of good and substantial irrigation works, a plan of administration which might be followed by other districts in the State, and the settlement of these reclaimed lands all under the auspices of the State.

A COMMISSION PROPOSED.

It will be impossible for a comprehensive plan, covering all these departments, to be decided upon

by this legislature, but the work should be begun, and the following suggestion is thought to be safe and conservative. Let there be a law enacted by this legislature making necessary appropriations, and authorizing the appointment of a commission of three men, whose duties are to be as follows: One, who shall be an irrigation engineer, to make examination of arid land which is deemed suitable for selection, making surveys, plans and estimates of all work to be constructed, and to report in detail on all that appertains to the reclamation of each tract.

Another, whose duties shall be to determine the best method of administration of the affairs appertaining to the operation of canals and irrigation of land in each district. This will require a man well equipped with knowledge of irrigation matters.

The other, to investigate the work of colonizing the land after reclamation. On his efforts depend the success of the enterprise. Hap-hazard colonization has ruined many good projects, but it should be just as easy to settle these lands with people of skill and thrift as with the opposite class.

Each member of the commission will thus have a special work to perform, and as the plans of each will have a direct bearing on those of the others, the three will sit as an advisory board, considering and adjusting the plans of all, in order to present one harmonious plan of action.

All this preliminary work should be done next year, and the reports and recommendations of the commission transmitted through the Governor to the legislature for its approval, and for the enactment, by it, of such laws as will be necessary to authorize the issue and sale of bonds for the construction of the works.

BENEFITS TO BE GAINED.

A brief summary will close this article.

IRRIGATION WORK IN IDAHO.

A TYPE OF THE DIFFICULTIES ENCOUNTERED IN BUILDING CANALS AND DAMS.

BY A. J. WILEY.

THE pioneer canal builders of Idaho have supplemented by eternal vigilance the mistaken economy of uneven grades, scant banks, steep slopes and timber structures. Experience in the operation of canals has shown the economy of a more substantial construction, and the old canals are being modeled upon a more permanent basis. The narrow banks are being strengthened by material from the steep slopes and the uneven bottoms, and the rotting timbers of gates and flumes are being replaced by stone and iron.

New canals are in some cases attempting to avoid the mistakes that have been so detrimental to the old, and a description of the methods used in one important canal now in process of construction will give a fair idea of the better class of canal building that has yet been attempted in Idaho.

DIFFICULTIES OVERCOME.

The headworks of the canal system of the Owyhee Land and Irrigation Company are on the Bruneau river in Owyhee county, Idaho. It was necessary that the head of the canal should be twenty feet higher

A million acres of land in this State will be reclaimed, affording homes for one hundred and twenty-five thousand people.

A section of the State will be developed having great natural advantages, which ought to make it the center of industry of the whole Northwest.

A conservative business policy for administering the affairs of each of these irrigation districts will be followed by all other districts in the State.

Under a wise plan of immigration an intelligent class of people will be drawn to this State, building up thousands of self-supporting homes. All other fields of industry will be entered, and trade will be balanced within the State.

It has been asserted that it will take 140 years to file on all the public land in Idaho at the rate of 340,000 acres each year.

At this rate of filing the first class agricultural lands, which it will be practicable to reclaim in Southern Idaho, could be taken in about four years.

This will be regarded as a bold statement in the face of representations which have been made by people of our State, but it will be found to be close to the truth after careful investigations have been made on the ground.

We appreciate the importance of careful management in the settlement of irrigated land when we see a tract of seventy-five thousand acres lying under one canal line, filed on in about two years' time by merchants, professional men and others unable to farm. All claimed, but not an acre cultivated nor a soul living on it, all waiting to be made rich through the efforts of an irrigation company, which of course died just in time to save itself.

No legislature of Idaho will have as important work before it as the one soon to convene, and we believe it will act in this matter not only for to-day but for the years to come.

than the water of the river. A "rock fill" dam was indicated by the abundance of broken rock with which the banks of the Bruneau were covered, but the narrowness of the canyon prevented the use of an independent waste way and forced the selection of an overflow dam. To build a timber dam in twenty feet of water (the depth of the river at the dam site) involved too great an expenditure, and it was decided to build that portion of the dam below the water surface of loose rock, and upon this foundation to build the upper portion of timber.

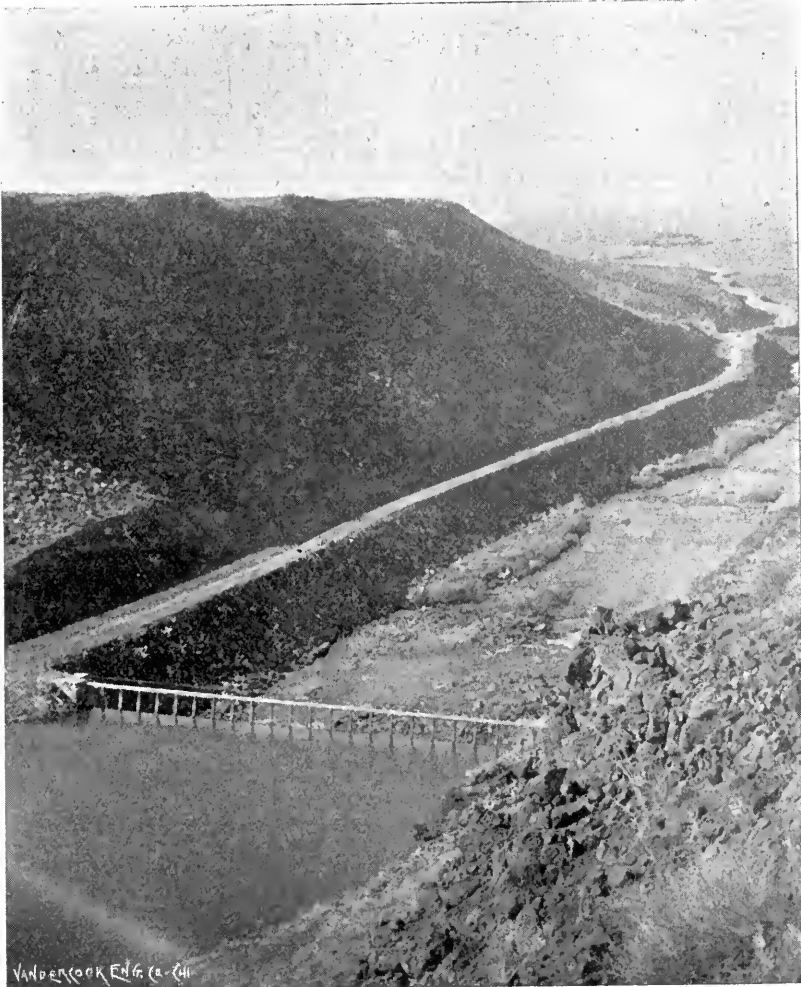
THE DAM.

The loose rock foundation is 176 feet long, 170 feet wide on the base, 110 feet wide on the top and 20 feet high, with its top five feet above low water. Upon the up-stream half of this foundation a timber dam of the ordinary triangular crib type was erected. The face of the dam is floored with four-inch plank-ing. It has a slope of $3\frac{1}{2}$ to 1, and is supported against the water pressure by posts resting on the mud sills. These are continuous beams of 12 x 14-inch timbers, crossing each other at right angles and

forming squares eight feet between centers. These sills were bedded in the loose rock without other preparation than leveling up the trenches in which they were laid. From the crest of the dam the water drops vertically fifteen feet to the apron, which is a heavy timber flooring covering the down stream half of the loose rock foundation.

The crest of the dam is level with the bottom of the canal, and the required depth of water at the head gates is secured by the use of flash boards.

building the timber superstructure was carried on with total disregard of the river flowing beneath it. But an accumulation of anchor ice, which cemented the loose rock as tight as masonry for nearly twenty-four hours and raised the river over the foundation of the superstructure, delayed the construction for about a day. Charges of dynamite exploded on the face of the rock filling would send the accumulated waters roaring through the foundation, but the channels thus opened were almost instantly closed by the ice, and



VIEW OF VALLEY AND MAIN CANAL.

These are supported by posts projecting above the crest, and carrying at their upper ends a set of iron brackets. Upon these brackets is laid the footwalk from which the flash boards are worked. Massive masonry abutments and wing walls, which are ten feet higher than the crest of the dam, connect it with the canyon slopes.

During the construction of the dam the flow of the river passed through the interstices of the rock filling, leaving its top perfectly dry, and the work of

the only relief came from a change in the weather and the melting of the ice. □

After the completion of the dam the foundation was made water tight by gravel dumped from a flat boat upon the face of the rock filling. There is no appreciable displacement or settlement in the dam after two years of use, and the loose rock foundation has served as perfectly as solid rock. The flood of the past spring was the highest ever known on the Bru-nau, and it was passed without damage to the dam.

THE HEADGATES.

The headgates of the canal are located on the south bank of the river. They are forty feet wide, ending in masonry abutments on each side. These abutments are ten feet higher than the bottom of the canal, and are connected by a masonry wall whose top is level with the bottom of the canal, and whose bottom extends eight feet below the canal.

This wall forms the sill of the headgates, which are eight in number, each five feet wide, and formed of a single plate of steel, strengthened with angle irons. The posts upon which the gates slide are each made of two sections of railroad iron, riveted together base to base, and set in the masonry footwall.

THE CANAL.

The canal supplied by these headgates is thirty feet wide on the bottom, forty-eight feet at the water line, and carries six feet of water. Its grade is thirteen inches to the mile, and its capacity is 26,000 miner's inches. The banks are nine feet high above the bottom of the canal, and are fourteen feet wide on top.

The portion of the canal between the headgates and the Snake river, $2\frac{1}{4}$ miles long, is called the "main canal." There are two waste gates on this section, one near the dam and one at the lower end of the main canal. Each of these gates is capable of discharging the whole flow of the canal, the first into the Bruneau and the last into the Snake river. They are of a somewhat novel design, and may be described as follows: A section of the lower bank of the canal is omitted, and replaced by two masonry "U" shaped abutments twenty feet apart. The top of the canal bank is made continuous by a bridge twenty feet long, resting upon the tops of the abutments. The abutments are connected by a masonry wall, whose top is level with the bottom of the canal. The space between the abutments and above this wall is the waste way. The waste way is regulated by a single gate, twenty feet long and six feet high. It is made in the shape of a segment of a cylinder, and turns upon the axis of the cylinder. The axis is horizontal, and the weight of the gate is

so counterbalanced that it is easily managed by one man working a rack and pinion gearing. The top of the gate is always placed at the same level as the surface of the water required in the canal, and forms a regulating weir. It is opened to a position of full discharge by lowering the gate till its top is level with the bottom of the canal.

The drainage of the country above the canal is passed under it through masonry arch culverts. The largest of these culverts is 126 feet long, and has a four-foot span. The lateral or distributing ditches are supplied by masonry culverts from the main canal. The main canal, as above described, is now completed, with all its accessories of waste gates, lateral gates, culverts and wagon bridges.

What is known as the "main branch canal" is an extension of the main canal down the south bank of Snake river. This canal is fifteen miles long, and is the same in all respects as the main canal, except that its width has been reduced from thirty feet in the main canal to sixteen feet in the extension. The surplus water of the main canal above the capacity of the extension will be used for the supply of a branch canal on the north bank of the Snake river, and for water power to pump water to a higher level for the supply of lands above the main canals.

The capacity of the canals is greater than would be needed for irrigation alone, but the conditions in the valley under the canal are somewhat unusual.

Every acre of the irrigable land is underlaid by gold-bearing gravel, covered by a few feet of soil, and the canals are designed to supply water for these mines as well as for irrigation purposes.

About four thousand acres of promising placer lands have been located directly under the canals now in process of construction. As above stated, the dam, the headworks, and the main canal are now completed. The extension of the main canal covering the mining ground is well along toward completion, all the more difficult portions having been finished already, and it is expected that the coming summer will see the waters of the Bruneau spread upon the valley of the Snake.



DAM ON BRUNEAU RIVER IN IDAHO.

UTAH'S LESSON.

BY J. W. GREGORY.

UNDOUBTEDLY if any reader of THE AGE, of average intelligence, depending upon the outward appearance of things as judged from the standpoint of experience, had been given a balloon view of the whole scope of country now embraced within the limits of the United States, but before any part of it had been reduced to cultivation, that portion of the whole now known as the Territory of Utah would have been pretty nearly the last to be selected as the site of a great, rich, self-sustaining commonwealth.

This is only a new illustration of the old saying that you can't always tell from the looks of a toad how far he can jump.

THE RESOURCES.

The people of Utah claim for their Territory that it contains every known mineral, and that the richness of such deposits, coupled with its capacity to produce so wide a range of fruits, grains and forage in immense quantities, constitute such resources that if the Territory were completely cut off from the rest of the world, she could still sustain her citizens in the comfortable enjoyment of all the necessities and luxuries of civilized life.

Making all due allowance for the pride of locality, it must be conceded that Utah is indeed a most resourceful, self-reliant commonwealth, and that in the genesis and growth of her civilization and development she has pretty nearly demonstrated in advance the truthfulness of the claim quoted, unduly boastful as it may seem at first blush.

THE MARVELOUS RESULTS.

The results growing out of the faith, courage and persistence of the little band of zealots who first settled in Salt Lake valley must be an ever-increasing marvel to the student of the achievements of American pioneers. What they have built up in Utah in a little more than half a century illustrates three facts: That irrigation and the small farm constitute the true and sufficient basis of industrial independence; that that faith in God which leads men to the faithful and patient performance of every duty, however

commonplace, becomes in its application and effect the most effective self-confidence—man's faith in himself; and that it always has been, is and always must be true that there is more in men than in seasons or soils.

The first settlers in Utah, coping with conditions and surroundings so apparently unfavorable that human invention could scarcely conceive a harder combination of circumstances, have worked out a material success which challenges the wonder and admiration of mankind. Analyzed, this success is seen to have proceeded from the painstaking discharge of the duty of the hour; confining individual effort within the bounds of individual ability; the faithful, patient, industrious use of natural agencies within reach; and, most of all, from that genuine coöperation of man with man through which communities may well-nigh work miracles.

A SIGNIFICANT LESSON.

One of the most significant of the lessons to be drawn from the peopling of Utah is taught by the fact that the rich mines of which the Territory now boasts not only were not utilized but were considered a detriment to the genuine progress of development. Whatever millions of gold and silver may now be extracted from her mountains to be pointed to with pride as the values appear in tables of statistics, the fact remains that her true greatness, her abiding prosperity, have sprung from and are based upon the small farm watered from the irrigation ditch. And, as if to emphasize this fact, Nevada, hard by, illustrates the contrasting method of attempting to build up a commonwealth on the mining of the precious metals. Despoiled of millions of wealth in gold and silver, and abandoned by those she has enriched, Nevada is turning toward that form of development which abides with and enriches the State by making homes for people, that development which alone can save her stability and permanent standing as a State.

It will be well indeed for Arid America if the lessons taught by Utah shall be duly heeded by the people of sister States and Territories.

KANSAS AGRICULTURE AND IRRIGATION.

F. D. COBURN, Secretary Kansas State Board of Agriculture, before the Irrigation Convention at Hutchinson.

MOST of our people are past the point of needing to be told that irrigation is a good thing, or even largely essential. What they want to learn now is the ways and means; they need to be told where there is water; its distance below the surface; the cost and capacity of wells, and the machinery for its most certain, economical and rapid lifting; carefully calculated plans for storage reservoirs, the times and methods of the water's most judicious application. These and kindred problems which confront the Kansas farmer have never so pressed for solution as during the last two years. Speaking for Kansas agriculture, in its larger sense for Kansas as a whole without in the remotest degree disparaging the importance of irrigation, or the need of giving it that

large measure of consideration that we are in duty bound to give it, I am convinced there is another kindred matter pressing, of equal, if not paramount consequence; although the utterance of such a conviction may be a little short of the rankest heresy in the Kansas State Irrigation Convention. Please do not infer from this that I am not as much and enthusiastically in favor of irrigation as any man from anywhere. The point I make is that the mass of our people who live outside of this marvelous Arkansas valley and beyond reach of its wonderful underflow should give a better appreciation to the rainfall; to harvesting and storing the wealth of water so copiously, beneficently sent them without money and without cost, and seeking (and finding, if permitted

to do so) that incomparable reservoir, the ample bosom of mother earth, where it is always within root reach, without wells, without pumping, without ditches; where every hour of the night and day its life-giving moisture is in its perfect way ready to help endow us with such a wealth of flower and fruit, of grass and golden grain as the people of few countries are ever given to see. This must be attained by a deeper, more thorough loosening, breaking-up of the impervious, compacted subsoil, that it may absorb and retain the rainfall rather than reject it, and as is now the case, compelling it to find its way to the rivers and the sea in disastrous floods. Acting on this idea along with that of irrigation, which we are here to encourage, there is no doubt about the wonderful future of Kansas agriculture. This is a part of our great problem that can be solved by individual effort. The records for the past ten years show that the average annual rainfall in Kingman County has been about twenty-five inches; in Ford and Trego Counties about nineteen inches; even in Kearney, Greeley and Wallace Counties about fifteen inches; in Decatur, Osborne and Cloud Counties about twenty-seven inches, and at Manhattan more than twenty-nine inches. Observers of such matters tell us that even these smaller quantities of water, while not all

that would be desirable, will, if judiciously conserved and utilized, well-nigh give us a crop every year, and in most years yields that are prodigious. The sort of irrigation problems that confront us are in the main radically different from those in any other like territory. Whenever any large proportion of our State is artificially watered it must be from wells instead of streams, and most of the help, most needed, is along that line. Government should help us to locate and determine the water supply. But we cannot wait on Congress; we must be up and doing for ourselves; we will have to rely chiefly on individual enterprise. I am deeply imbued with the idea that for us the way to irrigate is to irrigate and to subsoil. Kansas' salvation in this direction must be worked out by Kansas effort. The State law-makers must rise with us to the importance of this movement and take it by the hand. By judicious enactments and proper financial support the State should immediately provide for a line of progressive work in the way of surveys, experimentation, observation, superintendence, and advisory aid, thus doing at a very small cost per capita a part of the work that the individual cannot afford to do. The people in two-thirds of Kansas will be grievously disappointed if this is not done.

WHO OWNS THE MONEY?

IN view of the gloomy discussions, by papers and political speakers, the past two or three years, upon the subject of the awful "farm mortgage," it must be interesting, especially to western farmers, and more especially to those upon small, irrigated farms, to take note of the facts as to real estate mortgage indebtedness, brought out by the reports of the eleventh census. By these it is shown that the heaviest real estate indebtedness rests not upon the farm but upon city property, and that the heaviest weight of the farm mortgage itself rests not upon the newer western States, but upon eastern and central States. Kansas, for example, has been for some time past held up as the frightful example of wreck and ruin brought about by the farm mortgage, and, as a consequence, people in New York, Massachusetts and Pennsylvania became afraid to lend money in Kansas. Yet the official reports show that New York State bears the heaviest farm mortgage debt per capita of any State in the Union, and that the like debt is heavier in Massachusetts, Pennsylvania and several other States than it is in Kansas.

Farm mortgages are, in the main, given to secure the payment of purchase money for land and to make improvements, and instead of being an indication of retrogression and ruin, the farm mortgage is the stepping stone upon which the landless citizen mounts to the dignity of ownership—that is, it is an indicator of progress and growth. The census reports show that nearly ninety-five per cent of all the farm mortgages are of this character, while less than two per cent were made to pay wages of help, store bills and taxes. Most interesting of all is the fact that more than two-thirds of the farms of the country are free from mortgage.

WHO CAN PAY THE MONEY?

Apropos of this subject, it is a pleasure to call attention to the fact that the man who is giving proper care and cultivation to a small tract of irrigated land, bought at a reasonable price, can safely defy the deadly mortgage. Suppose a ten-acre home, provided with the means of irrigation, a neat dwelling, all the land under the high state of cultivation possible in such a case, where an industrious family devotes all its energies to a small tract—say five acres

devoted to alfalfa and the rest to fruits and vegetables. An incumbrance of \$500 on such a tract at eight per cent would be a "gilt-edged security." Forty dollars per year, or \$20 each six months, would cover the interest. Two or three shoats, kept on a little corner of the alfalfa patch and fed kitchen slops, small potatoes and the like, with a little Kaffir corn, would pay it. One hundred dollars a year laid by for five years would discharge the principal and leave a balance of accumulated interest to the credit of the farmer. Furthermore the profits off five acres of sweet potatoes, any average year, would more than pay the whole of it. Two good alfalfa seed crops would do as much. A single acre of prizetaker onions would more than pay it and an exceptionally good crop would double it. So would an acre of onion sets. These results are predicted at random upon the basis of what dozens of men have done upon arid lands upon the Great Plains in the past five trying years of hard times and descending values. The raw material for more than a hundred thousand such homes fairly entreats the attention of the unemployed heads of families in the great cities and manufacturing centers of the east, the land being obtainable at \$5 to \$20 per acre, with not a stump or a stone—not even a twig—in the way of immediate cultivation, and on ten acres of which a cash capital of \$500 and the proceeds of a five-year seven per cent mortgage for an equal sum will pay for land, sufficient buildings, fencing, absolutely reliable means of irrigation, team, utensils, seeds, nursery stock for first setting—in fact all that is necessary to lay the foundation for the support of a family and for laying up money besides.

These estimates are based upon the actual achievements of men most of them without previous experience in irrigation farming, the results of efforts extending over a series of years and attended by a very full share of reverses, ill-luck and unfavorable conditions, and it is upon such basis of fact that the opinion is founded that there is no loan better secured than that based upon a small farm of irrigated land occupied as a home. And it seems to me that business and philanthropy might be combined by the hoarders of idle money by using it to assist homeless families in establishing themselves upon such waiting irrigable lands.

THE DIVERSIFIED FARM.

The most prosperous agricultural community in America to-day are the Mormons, in Utah, and their prosperity is largely due to the fact that their twenty-acre farms are made to produce almost everything required for the food and clothing of the family. The South has passed through the great depression better than the North, and chiefly because since the failure of cotton speculation twenty years ago, the efforts of the southern farmer, statesman and newspaper have been devoted to building up a diversified agriculture, and with great success. Sustenance of the family, in all directions, from the farm, should be the watchword of the small farm-owner, and the small farm is to-day the most profitable the whole world over.

A GRAIN FOR THE ARID REGIONS.

BY W. C. FITZSIMMONS.

SEVERAL varieties of grains of African origin have been exploited as peculiarly adapted to drouthy areas. Among the most widely tried and most successful for the arid lands are varieties of Dhoura, also called rice corn and Egyptian corn. The white Dhoura is by far the most common, but the brown and black by some are pronounced superior. A variety of this species originated in Southwest Kansas, originally called "Jerusalem" corn, now known as "Bailey" corn, in honor of Judge L. D. Bailey, who brought it into prominence, is undoubtedly the best variety of the group yet tested in this country. It stands drouth better, is more productive, shatters less easily and makes in a shorter season. Its grain is distinguishable by being flattened into a disc-shape instead of being globular.

One serious defect of Dhoura in all varieties is that the fodder is of small value. The corn plant for the arid lands ought to be a fodder producer also, so that upon any failure of the grain, by reason of extraordinary drouth, or the occurrence of early frosts, or heavy hailstorms, the "roughness" might at least be counted on. Several varieties of sorghum have been found of great value on this account. They are sure to produce some feed in any sort of year, and under favorable circumstances, yield immensely of an excellent quality of fodder, besides producing paying crops of seed. The "Amber" has been found the safest variety for a regular and reliable crop. Broomcorn is another crop that yields a large harvest of excellent feed when grown and handled for that purpose. Many growers prefer it to sorghum for the purpose, and the seed may be to a certain extent used for feeding purposes.

Prof. C. C. Georgeson, of the Kansas Agricultural College, in response to inquiries, recently published a statement of the nutritive value of sorghum and broomcorn seeds for stock feed, showing that by analysis they rank very high in nutrient properties; but feeders have found that stock cannot be induced to eat such grains for any considerable length of time, except in combination with other feed in such a way as to pretty thoroughly disguise them. In fact they are valuable only as incidental or supplementary supply and not for steady feeding or for sole reliance.

The red and white Kaffir corns, however, seem to approach very nearly to the requirements of the arid land farmer for a grain and forage crop for stock. They require a somewhat longer season to mature the grain than do the best varieties of Dhoura, but when it is produced there is more of it, it is better feed, does not waste so easily in handling and there is always a fine yield of the best of fodder to supple-

ment the grain or make up in part for the lack of it. Of the two kinds the red Kaffir is superior to the white. It makes its grain in about two weeks less time, produces more largely, and the heads all come clean out of the sheath. The heads of the white Kaffir are apt to have a small proportion of imperfect moldy grains at the base, owing to the head not having pushed clear out of the sheath. The red Kaffir corn is pronounced by those who have grown and fed it for a series of years, equal in all respects, pound for pound, to Indian corn. It produces from 30 to 80 bushels per acre, yielding some crop even under the most slovenly neglect, and responding readily to generous cultivation and irrigation. Present indications are that it is the feeding grain crop par excellence for the semi-arid lands.

FOREIGN FOREST ADMINISTRATION.

IN view of the intimate relation between forestry and irrigation development and considering the monumental carelessness and indifference manifested by the authorities in this country in the matter of preserving and extending our wooded areas, it will be interesting to note how foreign governments deal with the question.

Nearly all the nations of Europe carefully control the forest supply, not only on public lands, but on private holdings also, and the cutting of trees is placed under rigid restrictions and official supervision. The forests are all highly protected, and even where no state control exists, the freedom in tree cutting which characterizes this country is unknown. In Germany during the last twenty-five years some 300,000 acres have been reforested, and the government has granted \$300,000 in this way to private owners of waste land. In Austria, since 1852, a forest law which exercises a strict supervision over the forests, both public and private, has been in existence, and no one is allowed to devastate a forest to the detriment of adjoining holders of land, and every cleared or cut forest must be replanted within five years.

In Italy the effort is constant to increase the amount of wooded lands, and the government contributes three-fifths of the cost of reforestation, upon condition that the work is done according to its plan and instructions. In Switzerland the national government contributes from thirty to seventy per cent. of the establishment of new forests, and from twenty to fifty per cent. for the planting of protected forests, and the law is very strict in regard to cutting. France is also deeply interested in public forest property. The forests belong largely to communities and public institutions, as well as to the state, and they are controlled in a manner similar to the regulation of forests in Germany. Here, as well as there, no clearing

is allowed except by the consent of the forest administration.

In all these countries the strictest attention is paid to the subject of forestry, and schools are everywhere maintained for the purpose of instructing men in this work. Russia has been the only nation where forests have been until lately under no restriction, but since 1888 even this country has had its forest law, and offers loans on favorable terms for the protection and increase of the forests. Hardly any European nationality is without its state control of the forests or without the training schools in which men are instructed how to take care of them. They are trying in Europe in every way possible to save the forests, and in the United States efforts are now being made in nearly every commonwealth to regulate and control the wooded lands, but our people are not yet ready to accept the stringent measures which have been employed in Europe, as a necessity, for their preservation.

GROWING ORNAMENTAL PLANTS FOR PROFIT.

FLOWER farming, the culture of cut flowers and bulbs for market, and even for the manufacture of perfumes, is an industry peculiarly adapted to the small farms in almost every warm valley of the arid region, as well as to southern California, as argued by Dr. Franceschi before the Farmers' Institute at Santa Barbara. A perfume factory is being seriously discussed for the Yakima Valley in Washington, and the irrigated valleys of Arizona and New Mexico are quite as favorable to many species as the less sunny vales of California. We quote from Dr. Franceschi:

"Flower farming may become a commercial industry and ornamental plants made to serve an economic purpose. Raising improved strains of garden flowers and plants, either by careful selection or by judicious crossing, is a kind of work made easy where fruits set and seeds generally ripen to perfection. It is eminently adapted to small farming, and even to persons in position to afford a large expenditure of intelligent application rather than of money or labor.

"To be successful in this field one must be a specialist, and work only in certain lines with a singleness of purpose and care. Of course one can hardly expect that the specialty he has chosen will not be worked by others, but in the production of new and improved varieties of flowers there is a virgin field not liable to be overdone.

"I will not attempt to enumerate the different plants to which attention may be called in this connection. Of such as are usually called garden flowers—that is, plants raised generally from seed which will bloom the first season, between those seen in every garden, those that have been introduced and undeservedly forgotten, and those that have not yet been submitted to culture—the number is indeed too large to be even partially enumerated. Selection from among this vast number must be made with judgment based upon what offers probable success. Impossibilities there are many, and it is not advisable for the flower expert to try and produce the sky-blue rose, the golden-yellow camellia or the scarlet petunia. But against these impossibilities the number of improvements and combinations to which nature is liberally open is indeed wide. The day is not far distant, in

my opinion, when we will be able to admire a whole series of white-flowered cannas, striped, blotched or edged with every shade of crimson, scarlet and yellow; morning glories (*Ipomæas*) of any size, ranging in color from sky-blue to bright scarlet, and from lemon yellow to fiery orange.

"Among flowering or decorative shrubs and so-called soft plants, what a number open to improvement and diversification. Look at the wonderful series of begonias, beautiful for either their flowers or for their unequalled foliage; look at the crotons and dracænas of European growers; at the caladiums of Lietze. On the other hand, the cleanothus and lilacs of Lemoine, the sweet-scented passifloras of McClibrán, and the numberless cattleyas, cypripediums and other hybrid orchids raised of late mostly in England; what do they all show? That it has been enough for an intelligent mind to take in hand any sorts of plants to raise admirable forms often surpassing nature itself.

"In this country, too, a start has been given, and without mentioning special cultures at Redondo, Pasadena and other places in Los Angeles county, the best exemplification is to be seen at our very doors in Ventura county, where the most remarkable work in this line has been carried on by Mrs. Theodosia B. Shepherd. At her place one can see many promising hybrids of begonias, cannas, anaryllis, cacti and other plants. Following in the footsteps of that enterprising lady, others have pushed forward with equal success. One has taken petunias and verbenas, another gladiolus, and so on. This leads me to suggest the growing of bulbs for commercial purposes. Calla lily and freesia bulbs are already largely exported, and no doubt other kinds can be grown equally well.

"The production of cut blooms for market is a matter worthy of attention. For cut flowers we have a demand at our doors, which, for about eight months of the year, will take a large amount of cut roses, carnations and other flowers. Besides the most important centers, such as Salt Lake City, Denver, Omaha, Chicago, all distant about three days travel by rail, over this territory there are many smaller towns to be supplied by our growers, because there is no local supply,

"On the Rivera the growing of cut flowers is practiced on a large scale on the flower farms and by small growers, who, of course, do not have the same facilities for disposing of their daily crop. I do not see why a Flower Growers' Union could not be started and be of as much service to the growers of ornamentals as similar organizations are to the growers of fruits. Under proper control and regulation it is not impossible to establish a lucrative trade in the more costly flowers that would bear transportation to St. Louis, Cincinnati and even New York. I am of the opinion that the day will come when we will be able to ship orchid flowers to the extreme East, considering the ease with which many of them can be grown here without artificial heat.

"The golden flowered Australian acacias do as well with us as on their native soils. Immense quantities of their blooms could be shipped from November to May. Some of the gums (*eucalyptus*) are also ornamental, keep well and would undoubtedly command a ready sale.

"In fact, the number of plants that can be profitably grown for cut flowers for export is so large that I refrain from giving even a partial list.

"In dried flowers, what a field before us! Santa

Barbara is well known as headquarters for the production of pampas plumes (*Gynerium argenteum*) and although the demand has been rather light of late, it nevertheless is a source of profit. Of other grasses, dried flowers and leaves, there are a number that might be experimented with to advantage."

HUNTING FOR NEW VARIETIES.

MANY of the best fruits known to horticulture originated as "chance seedlings." The infinite diversity of conditions under which products of the earth may come forth must sometimes result in improved varieties, and careful watch upon the sportive moods of nature has often enabled the soil tiller to introduce to mankind a most desirable fruit of some sort, while at the same time putting money in his purse. There is a certain element of speculative uncertainty in the efforts to produce choice varieties from seeds that attracts many enthusiastic men, and the result is almost yearly to bring out new varieties of value. Much has been done in the way of improving the potato. It is not unlikely that could Sir Walter Raleigh look upon the massive tubers of to-day he would fail to recognize them as of the same family with the insignificant affairs he planted in his garden in Ireland some three hundred years ago. From the splendid results attained the greatest encouragement to further effort should be felt by the experimenters. In growing potatoes from seed balls, an intelligent experimenter gives his methods substantially as stated below. In order to procure the best seed the balls should be fully matured and the seed ripe. The seed may be rubbed from the dry balls by hand and should be put away in a dry place until required for planting in the spring. The plants are best propagated from seed by sowing the latter in shallow boxes of convenient dimensions, filled with finely pulverized soil. Such boxes should be placed in a sunny spot and sufficiently watered and properly tended until the seeds germinate. When the plants are four or five inches in height they should be transplanted to carefully prepared beds, allowing six inches apart. The plants must be well tended, and in the fall they will show small tubers at the ends of the roots. Plant these until the next season, in a favorable location, carefully cultivate and await results. The true value of the progeny of these first plantings may not be apparent in the first or second generation, and it may be best to make careful selections for planting each year for three or four years in order to give a satisfactory test, taking note of desirable peculiarities as they may appear in the course of the experiments. While many and repeated experiments in this direction may not yield any results of value, still there is always the "gamble" that something choice may be evolved. Ten thousand peach seedlings have been brought to the fruiting stage to find that only one possessed superior merit, but this one paid the whole bill and much more. The same may be true of almost any fruit or plant.

PRUNING DECIDUOUS TREES.

IN the Sacramento valley, where we have the long hot seasons, the one custom has been adopted of low pruning; and this custom, I may say, applies to all varieties of fruit trees, including citrus varieties, with two objects in view, namely: First, to keep the bodies or trunks of the trees from sunburning. Second, to lessen the expense of thinning and picking

the fruit. The first, however, is of much the greater importance.

When setting out a new orchard my plan of pruning the young tree from the nursery is to cut the top back to fifteen or eighteen inches; at the same time examine all the roots, see that all bruised or mangled roots are cut off, and also cut back the long, scraggy roots that they may not be placed in the ground doubled or curled up. This treatment applies to all varieties of deciduous trees. During the first year's growth we watch the new shoots as they come out, and cut enough of the new growth to only leave from four to six of the stronger shoots to form the top of the tree, this being the first year's growth.

The following spring we cut this growth back one-half, sometimes thinning these branches down to three or four as the case may require, to make the tree well balanced and of proper shape.

The tree now starting out in its third year's growth is a time when the grower can assist nature in forming a perfect tree by thinning out the new growth during the summer months, pulling off suckers that may start below the main branches or limbs that were left to form the tree. This is time when good judgment must be used in pruning, for the foundation of the tree is laid and we come to the point when we prune for fruit.

So far as my experience extends, the following varieties of trees will stand what we call heavy pruning: The peach, the apricot, Bartlett pear, apple, nectarines and most varieties of plums. The French prune and cherry I would not prune heavily after the third year. My reason for pruning the first named varieties heavily is to make a stocky growth, that the tree may be able to support a heavy load. Their nature is to produce a long, slender growth unless cut back from year to year.

I wish to speak of the peach more especially, for I think there are more mistakes made in the pruning of the peach than of any other one variety. By care and good judgment in pruning the peach, we may prolong its life many years. Prune every year, cutting back and thinning out the center, using great care not to cut out too many of the little fruit spurs growing on the main branches, but cutting out the slender branches of the old wood, leaving as many branches of the new growth as the tree will support. In this case judgment must be used as to what the tree will support; the soil may be wet or dry, rich or poor, the grower must be the judge.

To grow small fruit, prune light. To grow large fruit, prune with care and judgment. To get this required judgment you must have some practical experience. The oldest and most practical grower of this State might write pages after pages on the subject of pruning, and when the new planter who wishes to start an orchard from the proceeds of his office (and we have many orchardists of this kind in California) will tell his hired help to prune his trees as Smith or Jones, for that is the rule laid down in "California Fruits" (Wickson). These planters or growers will in a few years want to sell their orchards, for, as I said in the beginning, we have too much theoretical pruning, which causes more expense and generally brings the grower more in debt from year to year.

When pruning is properly done it will assist in a great measure the work of thinning the fruit. As an example of this work I would refer to the orchards of Vacaville. There the pruning is done with the object

of producing large fruit, and also keeping in view the object of not overloading the tree with a lot of worthless small fruit.

Some writers claim the object of pruning is to thin out the tops of the trees to let the sun shine on the fruit, but this I think is of little importance.

Pruning that I might recommend might not do for the coast counties, hence the grower must be his own judge as to how he wants to prune.

You will find articles on the subject of pruning in the reports of 1887, 1889, 1890, 1891 and 1893, also in Wickson's "California Fruits;" all these are good articles. The time for pruning is when the trees are in their dormant state; beginning about January 1st is usually a good time.

When I can have my choice in pruning all varieties of deciduous trees I prefer doing the work when the sap begins moving in the spring of the year. Pruning at this time, all cuts of the wood heal over better, and the pruner can see how the buds are setting and then use his best judgment as to how much wood he wants to cut out.

Pruning is of great importance, and as growers we ought to meet with each other in our orchards, compare methods and examine results. By this means we can get some of the practical ideas wanted. There is much room for improvement in our methods of pruning, so let us compare ideas and try to excel in pruning as we have in other lines of fruit culture.

The Small-Farm Animals.—Of all the forage crops under the sun none lends itself to the needs of the diversified farm so thoroughly as does alfalfa. Beginning with the yield of eight to ten and more tons per acre under proper cultivation, it is cheaply harvested, cured without difficulty in the arid climate and requires no housing because there is but little rain to harm it. But it is in its all-round feeding qualities that its greatest value lies. As a feed for horses it is not superior, but they thrive and grow fat upon it if not subjected to severe labor; then a ration of grain as a supplement completes the combination. For dairy cows the alfalfa is one of the best of feeds, both summer and winter, either as pasture or when fed from the stack. Beef cattle fatten upon it in the coldest winter of the arid region without any other feed and at a very low cost per pound of meat. An alfalfa swine pasture is all that the porker needs from little piggery up to the last four months of his life, when an addition of grain quickly fits him for the barrel. For a small flock of highgrade sheep nothing will make fatter or heavier mutton than an alfalfa pasture in summer and free feeding from the stack in winter. We believe that even the ten-acre farmer will find profit on a few alfalfa fed sheep of high grade, after the custom of the English farmer. As a poultry food, however, alfalfa is most surprising, and if the small farmer thinks he cannot afford to raise grain in his alfalfa field he has an all-the-year-round food for the poultry, for the dry alfalfa hay softened up with warm water in winter, becomes just as palatable and useful to the fowl as if it were pecked from the open field. The conclusion is that the small irrigated farm with an alfalfa field may show as great a diversity in the animal product as in the vegetable line.

Good Fruit Well Packed and displayed handsomely is half sold. The extra price obtained and quick sales will more than repay the extra cost. Ad-

vertising is what pays. The pretty packages of prunes, raisins, etc., constitute a good advertisement of these California products. Foreigners are fine packers who know how to tickle the eye as well as the palate. Goods sent abroad should be put in attractive packages. A big market could be obtained in England for our dried fruits if shippers would only adopt good advertising and distributing methods.—*Gilroy Gazette.*

Speculative Farming a Failure.—The cotton planters of the South, the great wheat growers of the West, and the hop producers of the Pacific coast are essentially speculative farmers. So long as the hop men got good prices they were on the top wave, but the low figures secured for the crop at a time when they could least afford it opened their eyes widely, so that they now see clearly that the single crop system is foolish in the extreme. Intelligent southern planters told the writer a dozen years ago that it was exclusive cotton culture immediately following the war period, stimulated by abnormal prices, that caused greater loss to the South than did the war itself. Since that time, while the total cotton yield has increased, yet greater attention to corn, pork, vegetables and fruit has vastly strengthened the southern farmers. In Arkansas alone the increase in other products than cotton in one decade was about \$80,000,000. So the lesson goes the whole country over. Diversify, diversify, diversify.

Home Production.—The great lack of the new west is the production of sufficient food products for home consumption. The chief tendency of farmers everywhere seems to be to produce one or two crops and let the rest go even if it requires the purchase for cash of the commonest articles of food. The folly of this is shown in many western irrigated valleys where great crops of alfalfa are produced, but not half enough animals kept to consume it, while the farmers buy their beef, butter and even condensed milk and eggs. The result is a comparative overproduction of alfalfa in many of the interior valleys with corresponding low prices, while the farmers have to pay high prices for the necessary foods for the family which might as well be produced by feeding alfalfa itself. Barring California, scarcely one of the States of the arid region produces a month's supply of either pork, eggs or butter, and a rough estimate shows that these States pay fully \$100,000,000 each year to the Mississippi valley and eastern States for these items. No wonder money is scarce under such conditions! With a thoroughly diversified agriculture there would be less howl about the government handling of the currency problem.

The New England Abandoned Farms are still being counted by the hundreds in the yearly reports of the State boards of agriculture. Some of these are sold as low as from \$2.00 to \$10.00 per acre, and slow to find purchasers at that. Being New England born and raised, the writer from his western experience is sure that a large proportion of these so-called abandoned farms might easily be made of great value by the practice of irrigation during the drouth season, which drouth is the chief cause of the crop failures and low values for these places. To find an abandoned farm in the irrigated valleys of the West would be about as easy as to pick up a gold

nugget on the streets of Chicago. To diversify and to irrigate must be the watchword of New England as well as for the new West.

Profits on Alfalfa.—Evidences of the profitability of alfalfa on irrigated land in the semi-arid regions multiply from year to year. Here is the account kept by a farmer near Denver on seventy-seven acres of alfalfa the past season:

Received for 557½ tons hay @ \$5.00....	\$2,787.50
Pasturing 203 head horses, 3 3-5 months, @ \$1.50 per head per month....	1,096.20
Total receipts for season.....	\$3,883.70
Cost of irrigation and harvesting, for the season.....	940.00
Net profit for the season on 77 acres.....	\$2,943.70

Or \$38.23 per acre. This is not a phenomenal or rare return from alfalfa, many other growers having done as well—and better—the past few years. It should be remembered that alfalfa, once well set, is a well-nigh everlasting crop. There is no plowing, no seeding, no cultivation; only irrigation, harvesting and marketing, year after year, and a man can manage profitably large tracts of it. It is one of the few crops for which no expense for labor need be incurred until a paying harvest is "in sight."

Melons for Profit.—Rocky Ford, Colorado, melons have become deservedly famous, but for profit we have heard of none that exceed the Yakima product. This year we saw cases of a dozen cantaloupes that sold at \$4.00 per case, and many brought \$1.50 and more. For flavor none is more delicious than the old Christiana. The variety had pretty well died out when my good friend, Dr. E. Lewis Sturtevant, of Massachusetts, revived it by careful selection through a series of years. Now the leading seedsmen sell Sturtevant's strain of the Christiana, which yields much better than the ordinary, and fruits in large size.

Montreal Market is a very large and handsome melon of fine quality. I have seen specimens that sold for \$5.00 each in Boston market. Early Hackensack is a good market sort, if you can get the selected strains. Melons run out quickly if the grade is not kept up by constant selection.

A variety is desirable in market growing. J. M. Gilbert sold his melons at good prices in Tacoma last year, when others failed. Miller's Cream was his chief market sort. People did not like its looks at first, but when they had tried its flesh they came back for more, again and again. It cracks some, but its yield was so great that that did not count.

Emerald Gem with Mr. Gilbert cracked so badly that fully one-half were lost; its quality is of the finest. Hackensack was a big yielder, but of poor quality. This is a sort that varies greatly in its different strains, due to the degree of selection by growers; some of the selections are very fine in both quality and yield. Jenny Lind is a small sort of fine quality and a good yielder, liked for hotels and restaurants. As a general proposition, an abundance of water at ripening time causes cracking, softness and quick decay.

Send to the Director of your State Experiment Station for the bulletins issued. They are always of value, and any one can procure them without expense by making timely application for them.

Care in Storing Fruit.—It is scarcely too late to caution farmers and others who lay away a few barrels of apples for winter use, to use care in packing and handling the fruit. It is a well-known fact that a large percentage of the fruit stored for winter use is spoiled before spring. This should not be, and in most cases need not be, if proper care is bestowed in the handling of the fruit from the time it is taken from the trees to the time it is put into the cellar. Of course, apples not properly picked are liable to be bruised, and such are sure to decay. Apples for winter use should not be allowed to become too ripe, and should be carefully removed from the trees and all bruising avoided. Every defective apple should be thrown out, and the fruit thus assorted should be put in a cool place for two or three weeks to fully sweat. After this put into clean barrels lined with clean paper, being careful throughout not to bruise the fruit. Head the barrels tight and remove to the cellar and keep at a temperature of about 38 if possible. A little higher or lower temperature may be nearly as well; the main thing being to have it uniform at about the degree named. A good thermometer should always hang near the apple barrels and if it shows too high a temperature the windows should be opened during the day and cold air admitted sufficiently to regulate the temperature. Some advanced orchardists recommend wrapping each apple in tissue paper when packing in barrels for winter use. If the other precautions named above be observed, however, there will scarcely be a need for wrapping the fruit.

The California Fertilizer Law.—The want of a stringent law regulating the sale of commercial fertilizers has been felt in nearly every State at some time during recent years. Owing to the large amounts of commercial manures used in many of the cotton States, laws fully guaranteeing the rights of purchasers have been in operation there for some years. Wherever such manures are extensively used the need of appropriate legislation can scarcely be questioned. Until very recently the need for such legislation has not been felt in many of the newer States, but at a recent meeting of the Farmers' Institute, at Santa Barbara, California, the matter was brought up and ably discussed. As a result of the consideration of this question a committee was appointed to formulate a bill embodying all known requirements in this connection to be presented to the legislature at its coming session, which begins in January next. The committee comprises Messrs. Abbott Kinney, of Lamanda Park; N. W. Blanchard, of Santa Paula, and J. E. Packard, of Pomona. It is the wish of the committee to get the views of cultivators and others in the State or elsewhere who have knowledge of the subject or pertinent suggestions to make, to the end of embodying every essential point in the law at first, if possible. Readers of THE AGE in California are especially interested in this subject, and should aid the committee as far as possible in presenting a bill which may serve as a model for the legislatures of other States to work from in subsequent years; for it is certain that the extensive use of commercial manures in all parts of the country is but a matter of time and a better knowledge of the science of agriculture.

Bees should have water.

TIME TO IRRIGATE.

AS Euclid told the Egyptian Ptolemy of old, "There is no royal road to learning," so in our modern Egypt we may say that there is no golden rule telling us exactly when to irrigate our plants. It is a question which the experienced irrigation farmer has to settle, and each individual case has to be settled separately. It is a question where experience outweighs all rules and theories, and the experience has generally to be learned by failures, or partial failures.

Nevertheless there are natural laws and facts, a knowledge of which will greatly aid us, and of these I propose to dwell upon the most important.

When to apply water is governed by the needs of the soil and the plant. The soil needs it all through the winter months. The plant also needs it toward the end of the winter. This much, I think, we may safely decide upon.

The moisture left in the soil from the winter irrigation should be sufficient to start the spring growth. Now, as seventy-five per cent. of the growth of nearly every plant consists of water, it follows that it must be well supplied with this at the time when the great growth is being made. This should be in middle or late spring. Also at this time are our drying winds most prevalent, and the quick evaporation from the leaves has to be met by an equal supply of moisture from the rootlets; and here let me remark that for every cubic foot of water evaporated from the leaves a cubic foot of air has to enter the soil to replace the moisture taken out; and if the air cannot enter freely the moisture cannot come out freely, and the plant will wither or burn, no matter if there are oceans of water below. It is, therefore, as essential to keep the soil open as to supply water.

If a plant appears to want water, examine the soil six inches from the surface and see if it be dry. If not dry, it is probably cultivation that the plant requires.

During the hottest months of summer the plant growth is partly suspended and the tissues are hardening, and it is probable that little if any irrigation will be needed. The fall rains will render irrigation still further unnecessary. After cropping, it would be very desirable, and I think would pay well, to irrigate and plow, leaving the land rough and moist for the winter frosts, except, of course, where it is desired to put in a crop such as oats or rye.

Except for these general rules, it would be misleading to say when to water. One plant can stand and require water enough to kill another plant. A tree may flourish well under a liberal supply of water, but it may not bear fruit. Water enough to rot one tuber may be needed by another.

A good deal of experience may be saved, it is true, by a knowledge of botany. If you learn the natural surroundings and climate of a certain class of plants, for instance, you will know more or less what to do in the matter of irrigating them; but the only true way is to study the needs of each individual plant.

E. M. SKEATS in the *Eddy Argus*.

A New Grape Trellis.—Mr. T. V. Munson, a most successful and progressive grape grower of Texas, has devised a sort of trellis which is highly commended by those who have tried it. It consists of posts, set at suitable distances apart in the row of vines, standing five and a half feet high from the surface of the ground. To the top is nailed a cross-piece of 1x6 stuff, two feet long. Along each end of these crosspieces a wire is run so that the trellis has two top wires two feet apart. Eight inches below them a single wire is run, which is fastened directly to the posts. In using this trellis, a strong cane is brought up to this lower wire and the top pinched off and two branches trained to run along the wire, one each way. Then when the bearing branches appear, next season, they are carried out at the sides and hung over the top wires. Thus the fruit hangs down in easy reach for spraying and picking, yet is, at the same time, in the shade of the foliage of the vine. The bearing wood is renewed each year by two new side shoots brought out from the top by the upright cane.

One Method of Growing Plums.—A very successful plum grower near Denver gives his methods of culture as follows: "Cultivation is an all-important factor in raising plums. Failure in this respect means a failure of crop. I cultivate my plum trees oftener and better than corn. I run the cultivator up to the first of July and soon after I apply a mulch of coarse manure, or straw that is partly rotten, for the purpose of retaining the moisture in the soil to mature the crop, and also to mature the fruit-spurs and buds for the following season. In the fall of the year, however, I apply a light coat of barnyard manure, and in the spring I sow a quart of salt to each tree, as far as the branches extend. This promotes the health and growth of the trees, and from the dislike that insects have to this substance it drives away, if not destroys, many that attack both tree and fruit. I am careful not to irrigate after the middle of August, but turn on a good head of water early in December."

More About the Sugar Beet.—In those portions of the arid and semi-arid regions adapted to its growth, one of the surest and best paying crops is the sugar beet. This is a crop that may be grown with but a moderate amount of irrigation if the ground is properly prepared for the crop and the most thorough cultivation is practiced. One of the prime requisites in growing sugar beets for sugar making is that the ground be plowed deeply. In no other way is it possible to grow a straight, smooth root, such as is required in sugar production. A stunted, scraggy root, such as will be produced where the subsoil is dry and hard, will not yield a satisfactory per cent of sugar. Deep plowing and thorough surface cultivation, the two requisites in producing a good crop of sugar beets, are also the two processes which most surely and effectually conserve water supply. Hence it is, that if a crop of beets is properly planted and cultivated, the water used to irrigate them can be made to go a long way. A few acres of sugar beets, well tended, will pay the cultivator a larger profit than a big field of wheat at current prices.

A Large Eastern Fruit Farm.—There are many large fruit farms in western New York just as there are large grain farms in Illinois and Indiana.

It is estimated that three and a third million acres of arid lands in South Dakota have been reclaimed by irrigation, at a low cost. The value of these lands before irrigation was estimated at \$77,000,000, while now they are rated at nearly \$300,000,000.

One of these, belonging to John F. White, is situated in the famous Genesee valley, about a mile from the village of Mt. Morris, one of the old towns of the State.

This farm consists of 700 acres of as good fruit land as can be found in that section of the State. Two hundred acres are planted to peach trees, which are remarkably vigorous and healthy, but during the cold weather of last winter the buds were nearly all killed, so that there was not a bushel of peaches in the whole orchard. His apples were affected with the scab fungus the same as in other sections of the State; but his plum crop was a wonderful sight. There are fifty acres in one body, all four-year-old trees, comprising all the leading varieties, and nearly every tree had all the fruit it could possibly carry. But little rot was observed, and this seemed confined mostly to one or two varieties.

A story has been going the rounds of the agricultural and horticultural press to the effect that Mr. White has discovered a new way of disposing of his plum crop. It was to sell them while yet green for the purpose of making them into pickled olives. He says that this story was purely imaginary on the part of the reporter who started it. His plums are all picked when fully ripe and put upon the market in the best possible condition.

The varieties which seem to be bearing the heaviest crops are Lombard, Bradshaw, and a seedling called the Empire, which promises to be a much finer plum than any of the others, the Silver Prune also showing a good crop of remarkably fine fruit. One hundred trees of *Prunus Simonii* had very little fruit. They will be dug up and other varieties substituted.

Au Enthusiastic Opinion of Alfalfa.—Alfalfa is a curious grass, but a paying one, says an exchange. It is better than a bank account, for it never fails or goes into the hands of a receiver. It is weather proof, for the cold does not injure and the heat makes it grow all the better. A winter flood will not drown it and a fire will not kill it. It loves water and bores to reach it. As a borer it is equal to an artesian well. When growing there is no stopping it. Begin cutting a twenty acre field, and when your last load of hay is handled at one end of the field the grass is ready to cut at the other end of it. For filling a milk can, an alfalfa fed cow is equal to a handy pump. Cattle love it, hogs fatten upon it and a hungry horse will want nothing else. Bees will leave all other bloom for alfalfa. If your land will grow alfalfa, you will have the drop on dry weather. Once started on your land, alfalfa will stay by you like Canada thistles or a first-class mortgage, but only to make you wealthier and happier.

Nevada Statistics.—Nevada contains a total of 71,737,900 acres, of which the water area is but 1,081,000 acres, or less than one-seventieth. Its timber covers 2,600,000 acres, its pastoral area is estimated at 30,000,000, its mineral area at 15,000,000, and its agricultural area at 20,000,000. That is, the last given number expresses the area that may be reclaimed if water can be obtained. The State has now between sixty-five and seventy artesian wells, and it is estimated that storage in mountain lakes will, alone, provide water for 1,000,000 acres. Even were development to stop at a single million acres, that area, provided with sure and ample means of irrigation,

would support an agricultural population of a million people, in addition to the urban population and those engaged in mining, grazing, etc. Irrigation means much for Nevada.

Bees as Fertilizers.—According to conclusions reached by the agents of the U. S. Department of Pathology, bees, instead of destroying fruit, as they are sometimes accused, are the only agents through which certain orchards ever bear fruit. Pears are given special attention in a recent bulletin, and among others the Bartlett is pointed out as non-fecundating and must be fertilized by pollen carried from other trees by insects. The remedy suggested for non-bearing orchards is grafting other varieties into occasional trees.

Asparagus.—The best soil for asparagus is a warm, sandy or gravelly one with good drainage. A soil with hard-pan bottom will answer, if worked deep and underdrained with tile, but it is best to avoid such, because of the cost of repairing it for the reception of the plants. It is not advisable to place manure under the plants; but all manuring, except that used at the time of setting out the plants, should be applied to the surface and work in with a light plow or cultivator.

Water Measurement.—The mode of measurement of a miner's inch of water varies in different localities, but the most generally accepted legal measurement is that quantity of water flowing through an aperture one inch square, under a four-inch "head," that is, the surface of the water in the ditch or reservoir from which the water flows standing four inches higher than the aperture through which the water flows. The better unit of measurement is the cubic foot per second, which is, "in round numbers," equivalent to fifty of the foregoing described miner's inches. To reduce miner's inches to gallons, multiply the number of such inches by 14,961 and point off five decimal places. The result will be gallons per second discharged. To reduce gallons to miner's inches, divide the number of gallons discharged per minute by 8.9766. The result will be the number of miner's inches sought.

Orange Crop.—Reports from Central and Northern California orange orchards show that their supplies will cut a large figure in the market this year. The increase has been rapid in the last few years, but a large number of orchards are now for the first time fairly in bearing. The fact that the Northern California crop matures early and is for the most part out of the way before the Southern crop comes on the market is good for both sections. It makes it easier to avoid the glut that is the specter in front of our orchard men. The orange is a good money crop, in spite of the lower prices of the past few years, and it is to be hoped that the yield for the coming season will justify the promises now made for it.

At the Kansas experiment station in tests with oats it was found that the hot-water treatment for smut resulted in an average gain for the past three years of three bushels per acre in favor of treating the seed. In tests the amount of seed per acre the yield for light seeding was 32 bushels, for medium, 33½; and for heavy, 35½. The heavy seeding in these trials thus gave the best results.

Do Not Keep Scrub Stock. — It is always in order to advise farmers and stockmen not to keep inferior stock. It is well known that the cost of feeding and care of scrub stock is fully equal to that of the best grades, and it is always the poorest economy to keep such stock of any kind. A careful study of market reports by farmers, orchardists or stock-raisers will be found to yield valuable results if the lessons there to be learned are put to proper use. Recently sales of prime steers were made in Chicago at \$6.25 to \$6.30 per hundred pounds for animals weighing from 1,400 to 1,700 pounds. This means \$87.50 to \$107.10 for single animals, and must be convincing evidence that good breeds of cattle properly fed and handled give the farmer heavy profits. As a matter of fact it costs but a trifle, if any, more to produce stock bringing such prices than that which commands but one-half or one-third as much in the market. There is always room for such stock in all large markets, and a hundred animals of the best quality and size can be more readily marketed anywhere than a dozen scrubs. Irrigation farmers especially cannot afford to keep anything but the best stock, and they will always find that kind to be profitable. With the reasonable prices at which shorthorns and other good breeding stock can now be bought, little excuse is left for the scrawny, ill-conditioned animals so often seen on our farms and ranges.

Fifty Chickens versus One Cow.—An interesting discussion has been going on regarding the relative profit to be derived from a given number of chickens and a given number of cows. While one fancier declares that fifteen hens are more valuable than the average cow, a stout vaccine partisan swears by the beard of the prophet that he can make more money from one cow than any man can from 100 hens. The results of experiments made under varying conditions are now useful. One farmer made a test with fifty chickens and one cow, and gives the result as follows: Value of milk sold from one cow, \$144.10; income from the fifty hens, mostly for eggs sold, \$150.81. The cost of keeping the cow was given at \$52, while the maintenance of the hens cost \$50, and it was estimated that the value of the manure was equal for both. The farmer was greatly in favor of the hens in the matter of lessened labor, of care and attention, the cow requiring more time and far less agreeable labor. Numerous other experiments reported if summarized would probably result in favor of the hen if taken in the ratio of fifty to one. The chief value of the controversy has been to show that no dairy farmer should be without a fair ratio of poultry, and no poultry raiser should fail in maintaining a proper number of cows. For small, irrigated farms intensively cultivated, nothing is better able to contribute to the family needs than cows and poultry. As many of each only should be kept, however, as may receive the best care and attention, and pains should be taken to have only those of best blood and lineage. Right here is where the small, well watered and well tilled land holding becomes so potent a factor in the upbuilding of a higher and better civilization and citizenship. Everything on such a farm must be of the best; and the man who tills his few home acres as a chemist uses his laboratory, to achieve the best results which skill and science can evoke, must necessarily climb to loftier heights and take his family with him, than he who plods on, in the fruitless endeavor to cover a large area with any approach to scientific skill either in cultivation or management.

CHEAP ELECTRICITY IN CALIFORNIA.

THE plan of generating electric power by utilizing natural water-courses is no longer an unproved theory, yet the instances of its successful operation are not so numerous as to rob the accomplished fact of its novelty.

At Pacific Grove, California, a company has recently been formed to convey power from the Little Sur river to an electric railroad connecting Pacific Grove and Monterey, and also to furnish heat, power and light to the citizens of these towns at an expense less than the cost of fuel where steam is used.

In the projection of this plan a serious obstacle was met with in the great expense of the fuel needed for the production of the necessary steam. It was while considering this fact and reviewing their calculations that the idea was conceived of utilizing the waters of the Little Sur, a stream some miles down the coast, for the necessary power. The proposition of long-distance transmission was no longer a question. The electric works at Frankfort, where an electric current has been transmitted a distance of 110 miles with a loss of less than 20 per cent of effective energy, has been in successful operation since 1891. Similar plants are in full and perfect operation on the coast, notably that at Redlands, and that of the Standard mine at Bodie, both of which have successfully overcome obstacles to which the Little Sur proposition was but child's play.

An examination immediately followed, and when the experts, engineers and motor companies made their reports, the gentlemen interested were not only delighted, but were amazed to find that between 1,000 and 1,500 horse power was and has been for ages running to waste in this stream.

Estimates from reliable water wheel and electrical companies show that a plant capable of delivering a current equal to 450 horse-power in Monterey and Pacific Grove can be installed and put in operation for \$60,000, which is \$40,000 less than the capitalization of the company.

Careful calculation shows that this company can afford to deliver and sell in Pacific Grove and Monterey electric currents at \$5 per horse-power per month, which is less than the bare cost of fuel when the electricity is generated.

Before commencing work the company has guaranteed applications for power for more than 200 horse-power. With the advent of cheap electricity will come many new avenues of use, such as sewing machines, pumps for irrigating purposes, heating and cooking. The new works will run day and night without any additional cost for the fuel consumed each hour, as where steam is used. The little mountain stream that is to be the source of power is running perpetually.—*San Francisco Examiner.*

Heating Plates.—A new application of electricity to manufacturing purposes is reported from Germany in connection with the use of metal plates for pressing and finishing woolen goods. Such plates, which require to be heated, have hitherto usually been warmed in an oven or by means of steam, but both these processes are troublesome and involve loss of time, besides leading to uncertainty as to the temperature obtained. It is now proposed to heat the plates by electricity.

Selling Water by the Pound.—There is a feature of the irrigation question which is quite striking when you observe it. *The Ranch* recently called attention to it by saying that many of us fail to give water credit for all that it does and is in the grains, vegetables and fruits which we labor to produce and upon which our profits depend. Take, for example, the potato crop. The average yield of marketable potatoes per acre at Greeley, Colo., the great center of potato production, is about eight tons. Of this salable weight at least three-fourths is simply water. The average selling price, on the ground, for a series of years past, has been about 80 cents per hundred pounds, so that from each acre of his land the potato-grower has sold each season an average of at least six tons of water, at \$16.00 a ton. Onions, beets, carrots, turnips, etc., contain a still larger percentage of water, apples and the other principal fruits as much, alfalfa nearly as much, and so on through the list of principal and best paying products. From these facts the conclusion very naturally follows that while it is expensive to make, prepare and utilize the canals, laterals, gates, dams, pumps, reservoirs, etc., which enter into the construction of irrigation systems in order to supply water to crops, yet when it is realized that a considerable part of the water sells on the market at from one-half to three or four cents a pound, the plain business sense and profit in taking all pains necessary to supply water enough to produce the most luxuriant growth of plants are strikingly illustrated.

Some tests have been made this season in the semi-arid portion of Texas, of a new forage plant known as Russian millet, which it is thought will prove valuable as a dry-land forage crop. It appears to be a non-saccharine sorghum, and produces a large crop with very little moisture.

G. W. McClure, of the Illinois Experiment Station, puts the "Kansas" raspberry at the head of the list of black caps, following it with the Gregg, Nemaha and Palmer, and accords the Turner the place of leader of the reds.

Protect the young trees against the depredations of rabbits. Painting, rubbing the trunks of the young trees with axle grease, raw liver, fresh blood, etc., will continue to be practiced, but nothing is so safe and satisfactory as inclosing the tree stem, and for this purpose nothing is cheaper, more convenient, more effective or more quickly put in place than heavy, tough wrapping paper.

A fruit-grower near Tyler, Texas, alleges that he can get twenty-five cents a pound for all the good butter he can produce, but is offered only four cents a pound for his cotton. He is almost convinced that it pays better to cultivate Jersey butter than cotton, even in Texas.

We may often learn even from the "unspeakable Turk." In a recent talk on the preparation of coffee for the table, an old Turk engaged in the coffee trade in New York is reported to have said: "At home we roast the coffee, you Americans burn it; we powder it, you grind it; we steam it, you cook it. The result is, we save the bouquet, the flavor, the strength; you lose them all in the burning, grinding and boiling."

On Selecting and Buying Trees.—The inexperience of many would-be fruit growers in the irrigated valleys has led them into grievous errors. They have bought trees because of cheapness rather than quality; have paid no heed to the locality where grown as bearing upon results; have overlooked the fact that ten cents in the price of a tree might make dollars of difference in its first season's fruiting and more in following years. Thus they have been easy dupes to the wiles of tree peddlers pretending to represent reputable nurseries at a long distance away. We are led to these remarks by the opposite of H. A. Carmichael, who is interested with millionaire Marcus Daly in large fruit growing operations at Hamilton, Montana. Mr. Carmichael is an old-time Western New York grower and insists on the best at any price. A few years ago he bought several carloads of tree stock from his old friends, Smiths & Powell, at Syracuse, and the results have been highly satisfactory. He claims that northern-grown trees are far superior to southern, being hardier and more vigorous, even though the southern grown may be as good for the southern portion of the arid region. Indeed, the point has been made that fruit trees and plants should always be moved east and west along lines of latitude, or in isothermal belts, and never north and south. How true this is remains to be proven, but it is safe to practice at any rate. Experienced fruit growers now-a-days rarely buy trees of any traveling agents, and only a few of the reliable nurseries employ them now, preferring to deal wholly by mail or direct negotiation, trusting to their well-earned reputations to give weight to their representations. By this system, first-class stocks can be sold at much lower prices than where agents are on big commissions. In this direct dealing, too, there is greater surety of securing stocks true to name than in trusting to the alleged "agent" who is too ready to have whatever varieties the buyer desires, as he can easily be out of reach when the trees bear fruit, while the established nurseryman has his reputation to maintain. Only No. 1 stocks are even fit to plant, although it is often, indeed usually, wise to purchase young and light weight trees and plants, because of freights and because they more readily adapt themselves to transplanting and new conditions.

Windmill Irrigation.—J. F. Monson of Sedgwick county, Colo., thus gives his experience with windmill irrigation: "During the extreme drouth of three years ago an idea struck me to construct a reservoir and use windmills and pumps to fill it. I selected the only suitable place on the farm to build the reservoir, which was sandy or rather gravelly, and it was necessary to build it of stone and cement inside. It was made 80 feet in diameter with $4\frac{1}{2}$ feet walls banked up all around on the outside. I dug two wells as near the reservoir as possible. I had to go 20 feet for a supply of water, so erected two 12-foot windmills. One of them operates a 4-inch double acting cylinder and throws a 2-inch steady stream; the other mill operates a 4-inch single acting cylinder which does not pump so much as the other. With this arrangement I can irrigate about 10 acres of land. I have raised garden stuff, mostly onions, celery, potatoes, and have begun to plant fruit trees and small fruit, and it has thus far paid fairly well on the investment considering my inexperience in irrigation. I feel thoroughly satisfied that with experience and good attendance it will be a paying investment."

PULSE OF THE IRRIGATION INDUSTRY.

THE ARID-ZONA.

ARIZONA is forging to the front as a producer of fine fruits, and where fine fruits may be produced in abundance, there magnificent homes will be built up, because sunshine and flowers, bees, birds and rippling waters are the inevitable accompanists of the golden orange, the blushing peach, the melting pear and delicious grape. When all these things are combined, heaven is not very far away. Given such a combination, whatever other and more prosaic things may be considered necessary may be readily obtained, because fruit culture under the favorable conditions afforded by abundant sunshine and abundant water, pays. It is not to be wondered at, therefore, that Arizona already boasts the foundations, at least, of princely homes. The *Arizona Daily Gazette*, some issues past, described one of these as a ranch belonging to Chaplain Scott, ten miles northeast of Phoenix and two and a half miles east of Arizona Falls. It consists of a half section, all under high cultivation—and thorough irrigation of course. Tall pepper trees shade the home buildings and a very great variety of fruits may be found, in thriving condition, upon the grounds. Apricot trees set out two years ago, paid a net profit this season of a dollar per tree. All through the great strike, from 75 to 125 boxes of early grapes, weighing 30 pounds to the box, were shipped daily, bringing from \$1.00 to \$1.25 per box, net. Later there were magnificent Muscats, Lady Downings, Flaming Tokays and many other varieties for shipment. One portion of the ranch is occupied by a large orange orchard, for which the locality and soil are said to be well adapted. Alfalfa also flourishes and grain does well. Among young trees, not yet in bearing, were grown this year sixty acres of peanuts, yielding a large crop and of finer quality, it is claimed, than the famous goobers of the Old Dominion. There may be but little poetry in peanuts, but if they pay they may associate with orange blossoms all right. The orange blossom question is supposed to be pretty largely one of finance, in all its phases, these latter days. Not to get clear off the subject, however, Arizona undoubtedly once sustained a population of millions of people, as the traces of its great ancient systems of irrigation canals mutely testify, and it undoubtedly may again sustain its swarming multitudes, when the water and the land are reunited.

KANSAS STATE BOARD OF AGRICULTURE.

The Kansas State Board of Agriculture will inaugurate a new feature in its forthcoming annual meeting at Topeka, January 9 to 11 inclusive, by devoting one day of the session (probably Friday, January 11) to the consideration of topics connected with irrigation. In line with this, C. H. Longstreth, who is widely noted for having been so successful in Kearney county, Kansas, is to address the meeting, telling of his wide experience in "Fruit and Vegetable Growing Under Irrigation." Geo. M. Munger, who has a plant for irrigating a 500-acre orchard in Greenwood county, will tell of his observations and experiences up to date. Chancellor F. H. Snow, of the

State University, is to talk on the subject of "Periodicity in Kansas Rainfall and Possibilities of Storage of the Excess in Rainfall." A. B. Montgomery will give his wide observations as to "Irrigation Possibilities Upon the Higher Lands of Western Kansas," and Senator James Shearer, of Marshall county, will deliver an address entitled "Making the Most of Our Natural Supply of Moisture." C. D. Perry, of Clark county, who has 1,200 acres under irrigation, will explain what and how he is doing, using models and illustrations. H. R. Hilton, of Topeka, will give an illustrated lecture on "Water in Soils," and Prof. Haworth, of the University, will likewise talk on a geological topic in reference to these subjects. In connection with these listed speakers, Robert Hay and dozens of others best posted in these matters are expected to be present and take part in the discussions. It is hoped to make this the most useful, practical and interesting meeting the board has yet held.

A WISE POLITICAL PLEDGE.

If all politicians were as wise as some of those in Montana, irrigation legislation would speed as rapidly as its vast importance demands. Hon. Donald Bradford, of Helena, wrote the following plank of the platform of a party in his State, which we commend to legislators generally for careful consideration: "We pledge our delegation in the legislature to the passage of such laws as will place in the hands of the people, without the intervention of private corporations, the necessary water supply for irrigation."

SOUND BUSINESS SENSE.

We have been invited to go into an irrigation scheme in Southern California, which is to cost \$2,000,000, but is to be capitalized at twice that sum, while water rights at \$20 per acre are to be issued to the tune of eight millions. Thus the poor settlers are to pay for their water a sum that will yield a big revenue on six times the actual investment. It was represented that our share in the profits would be upward of \$400,000, simply for booming the scheme! We are urged to join a large party of agricultural editors who start next week to view the site of this fabulous wealth. Yet we decline! Why? Because we have enough to do to attend to our own business; because we believe an agricultural journal should be perfectly independent and free to work for the farmers' welfare; because we believe no farm journal should thus mortgage itself to any scheme or delude its readers with the idea that its advocacy is solely in their interest when it is really in the interest of an outside scheme in which the publisher happens to be engaged. These are reasons enough for any self-respecting journalist to keep free from all such entanglements. We also decline to be a party to the scheme in question because we utterly oppose this species of financiering that aims to burden industry with tolls to pay dividends on fictitious capital. Agriculture can't stand it in irrigation works any more than in railroads.—*American Agriculturist*.

A NURSERY BY IRRIGATION.

The Walla Walla country in Washington is most noted for its wonderful crops of wheat and its great fruit orchards. As represented at the World's Fair it informed the nation of the great possibilities for horticulture in the far Northwest. Dr. Blalock's great fruit farm astonished the eastern horticulturist with its \$2,000 per acre product of superior pears. Of no less interest are the nurseries of C. L. Whitney at Walla Walla, where are produced the stocks for a large proportion of the orchards of the Northwest country. It has become a cardinal principle with the experienced orchardists of Washington, Idaho and eastern Oregon to choose their stocks from nurseries within the territory bounded by the Rockies on the east and the Cascades on the west—natural barriers against the introduction of insect pests and fungoid diseases from the wet regions of the West coast and the infected nurseries of the eastern States. The nurserymen of that great inland empire between the mountains appreciate these conditions, which are specially favorable to their industry, and with Mr. Whitney, who is President of the Northwestern Nurserymen's Association, unite heartily in coöperation with the fruit growers to prevent the introduction of the pests by rigid quarantine, and when any do get in wage a rigorous and unceasing war against the enemy. Mr. Whitney's nursery is a product of irrigation and is a model of its kind. We hope soon to present a careful article on the Walla Walla region and shall then attempt a detailed description of the highly interesting methods practiced in these nurseries.

A MONTANA CANAL.

Many irrigation canals are being commenced in Montana. The El Dorado canal, taking water from the north bank of the Teton river, is ten miles long, fifteen feet wide on top, twelve feet wide at the bottom, carrying two feet of water. Ira Meyers, of Great Falls, the President of the company, in a late interview estimated the capacity of the canal at 12,000 miner's inches. He says there are between 30,000 and 40,000 acres under the canal, the soil being a gravelly loam, and that the ditch can water nearly all of the land. No reservoirs have yet been built; at present they are not needed, as only a small portion of the land is in cultivation. The principal crop so far has been hay, timothy and blue joint doing particularly well and yielding enormous crops where irrigated. The land is well suited for raising oats, wheat, barley and potatoes, and this is a great advantage, lying as it does in the center of a vast stock-raising district.

TEXAS ENTERPRISE.

That Texas people are becoming fully aware of the importance of irrigation to their State is evidenced by the large number of irrigation enterprises now under way. Here is a recent enumeration of important projects of that sort now in progress: Several on an extensive scale on the San Antonio river near San Antonio; on the Pecos, near Menton, in Loring county; on the San Saba river, near San Saba; on the Concho, near San Angelo; at Brownwood in Brown county; on the Colorado river near Ballinger and near Colorado City in Mitchell county; on Sweetwater creek, in Nolan county, near Sweetwater; on Elm Fork of the Brazos, near Abilene, in Taylor county.

WHAT ELECTRICITY WILL DO.

A number of experts have been giving their opinions as to what the world of 1900 will see in the development of electricity. They say all the street cars and those of railways to points within 100 miles of the large cities will be propelled by this agent. Electric brooms will sweep the streets, electric fans will cool the air of homes in summer, electric cookers and lighting will do away with coal gas, and the domestic millennium will begin.

Both the arc light and the incandescent lamp will be superseded by the Tesla illuminator, which gives a beautiful and mysterious light without the intervention of either globe or lamp.

We shall telephone as easily across the ocean as we now do to our friends in the next square.

Wherever there are water powers or coal fields electrical energy will be transmitted to points a hundred miles away. Instead of loading coal upon cars and conveying it to the factory or machine shop to be converted into power, the power itself will be conveyed in the form of electricity, and this in turn will move all the necessary machinery for manufacturing and pumps for irrigating.

At this time a machine is at work in several large offices which receives and prints as fast as it arrives all the news of the day. It is like a constant newspaper being printed all the time. Printed matter is rolled off upon a piece of paper in much the same fashion as the ticker prints.

THE GREAT QUESTION OF THE NATIONS.

That conservative and patriotic newspaper, the New York *Commercial Advertiser*, speaking of the address before the Trans-Mississippi Congress at St. Louis last month, by Wm. E. Smythe, on "Irrigation as a Great National Issue," discusses it as follows: "This title will seem rather sweeping to the people of the cis-Mississippi States, in which the rainfall is usually sufficient to guarantee good crops. It is not generally known that west of the 100th meridian, on a line drawn north and south through the western third of the State of Kansas, rainfall cannot be depended on, and that the farmer must resort to irrigation. There are a few favored spots, like western Oregon and Washington, to which this does not apply. But it can be stated in a general way that fully three-fifths of our territory, leaving out Alaska, cannot be cultivated without irrigation. From this we can see that the title of Mr. Smythe's paper is not too sweeping.

"It is to be regretted that only the barest skeleton of this address has been sent us, yet to those who have given the subject thought the outline is full of suggestion. While 'the Great American Desert' of our childhood has long since vanished, there are in the West hundreds of thousands of square miles of the most fertile lands in the world, that only await the coming of water to be converted into Edens. The Mormons have illustrated this in Utah. The traveler can see the effect of water on the torrid alkaline stretches to the east of the Coast Range in Southern California, where a luxuriant and tropical vegetation has sprung up about artesian wells sunk in the desert.

"The Missouri, the Platte, the Arkansas, Canadian, the Pecos and Rio Grande Rivers, will yet be so controlled that they will fertilize millions of acres, and their arid valleys will yet teem with an opulent agricultural population. Other rivers of the West can

be used in the same way; and the power of the artesian well is only in its infancy. The same question is agitating the people of Australia and South Africa, so that Mr. Smythe without exaggeration might have entitled his paper 'Irrigation the Great Question of the Nations.'

The St. Louis *Republic* published the address in full and its editor spoke of it as the chief feature of the six days' session of the Congress.

IRRIGATED FRUIT LANDS.

Did you see the fruit in the Idaho Exhibit at the World's Fair? Nothing finer, first premiums and all raised on irrigated land. It's sure, it's abundant, it's profitable, it's your opportunity.

The country is new, the lands are cheap, and the eastern market is from 500 to 1,500 miles nearer than to similar lands in Oregon, Washington and California.

Advertising matter sent on application. Address, E. L. LOMAX, G. P. & T. A., Omaha, Neb.

Farmers in the vicinity of Schuyler, Nebraska, have a prospect of obtaining water for irrigation, as the Platte and Colfax County Irrigation and Canal Company has been incorporated and a corps of engineers are already surveying the route of the canal, which will draw its supply of water from the Loup river.

Ex-Governor B. H. Eaton, of Colorado, is one of the most extensive irrigation farmers in the country. The past season, he has had farmed ninety-five quarter sections in the vicinity of Greeley and adjacent towns. As all his farming is by irrigation, it is needless to say that his returns have been large.

Many new buildings are being erected in La Junta, Colorado, and the town is prospering.

It is reported that Mr. Parker Earle, ex-president of the American Pomological Society, in connection with Messrs. Stark Bros. of Louisiana, Mo., has decided to embark in apple growing on a grand scale in the Pecos valley, New Mexico. The parties interested are expected ultimately to plant orchards there aggregating 10,000 acres.

The Nebraska State Association will hold its next session in Kearney, beginning December 18, 1894. A large attendance is expected, and the meeting will undoubtedly be an enthusiastic success.

The Curtis irrigation canal is being extended to cover more land below Curtis, Arizona, and incorporation papers have been filed.

RECENT LEGAL DECISIONS.

Prescriptive Rights for Use of Water for Irrigation.—The fact that the owner of land on a fork of a stream used all the water in such fork, does not show such an invasion of the rights of a prior appropriator of water from the stream below the two forks as to give to the former a prescriptive right to use all the water in the fork, the lower owner having always received enough water for his purposes through the supply coming from the other fork of the stream. Though it is a question of fact as to the amount of water actually diverted by a person claiming a right thereto by prescription, yet, as it is a matter of common knowledge that persons build their ditches with a view to the quantity of water needed, slight testimony is sufficient to show that the full capacity of his ditch was used.

Faulkner v. Rondoni. (Supreme Court of California.) 37 Pac. Rep. 883.

Compensation of Attorney for Collection of Claims Under Drainage Act.—Where one employed an attorney to collect certain judgments against a drainage district for land taken and material furnished, he to receive a certain amount if successful. At the time the judgments had been declared void, the act organizing the drainage district being unconstitutional, the legislature passed an act providing for the payment of claims arising under the drainage act. The board of examiners, acting under the latter act, on the presentation of such claim by another attorney, employed without the first attorney's consent, allowed the claim for the same amount as the judgments, though they, being void, were not admitted as evidence of the claim. The "judgments" and the claim allowed were in effect the same, and the first attorney was entitled to the agreed fee. Where a person, after having employed one attorney to collect a claim, without the latter's knowledge employs another to collect it, the burden of proof is on him to show that the first attorney had either expressly or by lack of effort abandoned its collection.

Craddock v. O'Brien. (Supreme Court of California.) 37 Pac. Rep. 896.

A California Suit.—The San Joaquin and Kings River Canal and Irrigation Company, of California, asks \$20,000 damages against the Fresno Flume and Irrigation Company because the latter diverted the water from Stephenson creek, which the former company claim, their right dating back as they say to 1871.

Idaho Bond Foreclosure Suit.—A suit entitled Alfred Eoff and H. B. Eastman, trustees, v. the Boise City and Nampa Irrigation, Land and Lumber Company, et al. has been commenced. The suit is brought to foreclose mortgage bonds in the sum of \$50,000 issued in 1888. W. E. Borah is attorney for the trustees.

A Utah Complication.—George C. Whitmore, of Nephi, Utah, has commenced suit against E. H. Sparks and the Nephi Irrigation Company to recover damages in the sum of \$750 for the conversion of six certain shares of water belonging to plaintiff. The water is valued at \$50 per share and plaintiff seeks to regain possession of same.

NEW COMPANIES.

Arizona.—Coronado.—The Coronado Canal and Land Company has been incorporated by John B. Francis, Benjamin F. Rhodehamel, James M. Rice, George H. Littlewood, Joseph B. Greenhut and others, for the purpose of constructing, maintaining canals, ditches, flumes, aqueducts, dams and reservoirs and such other appliances as may be necessary in impounding, conducting, controlling and delivering water for irrigation and other purposes. Capital stock, \$2,000,000.

Kansas.—Stockton.—The Stockton Irrigation and Power Company, of Stockton, Rooks County. Capital stock, \$100,000. Directors: I. N. Pepper, T. E. Baldwin, A. E. Wilson, J. W. Callender, J. W. O'Donnell, George O. Farr, P. H. Cooper, D. B. Smyth, M. J. Coolbaugh, Jr., Charles Alexander and J. Q. Adams.

Kansas.—Ingalls.—The Ingalls Irrigation and Canal Company has been incorporated with a capital of \$50,000. The company will construct and maintain a canal, together with ditches, laterals, dams, dykes and flumes for the purpose of irrigating a large acreage of land in Gray County. Directors: D. W. Patton, D. B. Hungate, Smith Payne, W. M. Brooks and C. B. Douglass.

Nebraska.—Schuyler.—Articles of incorporation of the Platte and Colfax County Irrigation and Canal Company have been filed. The incorporators are Orlando Nelson, Clayton A. Gates, Ira E. Gates, Charles A. Woolsley and Elon W. Nelson. The purpose of this incorporation is, as the title suggests, to construct a canal principally for irrigation purposes; said canal to start from a point in the Loup River about two and a half miles southeast of Genoa, Nebraska, and run through Platte County and through Colfax County about as far as Schuyler, there emptying either into Shell creek or the Platte river—making a canal about forty miles in length and carrying sufficient water to irrigate at least 150,000 acres.

Nebraska.—Hastings.—The Blaine County Irrigation Company was incorporated last week, and surveying the route of the proposed canal has already been commenced. The company starts with an authorized capital of \$40,000, and its officers are as follows: E. W. Rankin, president; S. A. Daily, vice-president; E. H. Riggs, secretary, and P. C. Erickson, treasurer. The proposed ditch will be about twenty-five miles long through Blaine County.

Texas.—Brownwood.—The Brown County Irrigation Company has been organized by C. H. Jenkins, S. R. Coggin, F. A. Swinden, C. C. Wilkins, W. H. Clark, D. H. Wood, J. F. Smith, J. W. Taylor and L. C. Scott. The company will build an immense dam for irrigation purposes.

Wisconsin.—Monroe.—American Falls Land Irrigating and Power Company, Monroe; capital, \$200,000; incorporators: Nicolaus Schmidt, John Legler and Henry H. Hefty.

PEACHES AND NATURAL GAS.

GRAND JUNCTION, Colorado, is just now coming in for its share of glory and profit, it having been made known to the world for the first time, on a large scale, that the country surrounding this wonderful young city is capable of producing all of the finest deciduous fruits to perfection and in profusion. Everybody now knows about its great annual festival, called "Peach Day," but the world doesn't know that the very land that produces these peaches has beneath it a field of natural gas.

A combination of business men recently organized the Western Colorado Development Company for the purpose of sinking an artesian well, with which to water a large body of fruit land held by it, and were agreeably surprised to strike a heavy flow of gas. Experts who were here pronounce the find indicative of the presence of a strong oil field, but the members of the company incline to the belief that a much greater flow of gas will be encountered.

The company has leased over 4,000 acres of land, and it is its intention to prosecute the work and fully develop the gas or oil, and at the same time bring under irrigation a body of land comprising over 5,000 acres held by it, which of itself is a fortune. The prospectus of the company, which has been sent to many inquirers, is very readable matter, and many Eastern people, principally in Ohio, Indiana and Illinois, are becoming interested in the enterprise.

For size and prospective profit, the scheme ranks any offered in California, for the reason that the lands

here have not touched the boom figures which prevail in that State, and it has been proven, so the Colorado people claim, that the percentage of profit per acre is with them much greater. Certain it is that this point is less than midway from Chicago to California, and this of itself is a point in its favor, the fruit, in consequence of its proximity to Eastern markets, being picked at a riper stage.

The Chicago *Herald* of September 12 accorded "Peach Day" an entire telegraphic column on its first page, and other Eastern papers and the Associated Press dispatches spoke in praise of the country and the efforts of its pushing people.

The New York *Sun* recently contained an article asking for better peaches, and the Grand Junction people think they have solved the problem.

They swept everything at the recent Nebraska State Fair, and

now have on exhibition in Denver several carloads of fruit of all sorts that is attracting crowds both night and day.

Several members of the late Irrigation Congress wound up their trip by taking in the sights at Grand Junction, and they were unstinted in their praise of the country and its products.

It seems that the city is the one place which will attract attention during the coming year.

The Horticultural Society idea is spreading. Throughout Washington, Oregon and Idaho, there have been half a dozen societies organized within the last two or three months.



SOME PLUMS FROM
GRAND JUNCTION,
COLO.



MY HUSBAND

Can't see how you do it.
\$60 Kenwood Machine for - \$23.00
\$50 Arlington Machine for - \$19.50
Standard Singers - \$8.00, \$11.00
\$15.00, and 27 other styles. All at-
tachments FREE. We pay freight ship any-
where on 30 days free trial, in any home
without asking one cent in advance. Buy
from factory. Save agents large profits.
Over 100,000 in use. Catalogue and test-
imonials free. Write at once. Address
(in full), CASH BUYERS' UNION,
158-164 West Van Ruren St., B 120, Chicago, Ill.

Unthrifty peach trees are benefitted by potash.

"Valley, Plain and Peak" is the title of a handsome little booklet issued by the Great Northern Railway, describing the cities, towns, valleys, and points of interest between Minneapolis, Minn., and the Pacific Coast.

It is profusely illustrated with engravings, showing the most notable scenery from Lake Minnetonka to the Cascade Mountains and the glaciers of Alaska.

It can be secured from Mr. F. I. Whitney, G. P. & T. A. of the Great Northern Railway, St. Paul, Minn., for ten cents in stamps.

Parties Looking for an Irrigation and Colonization Property,

Ready for immediate settlement, with a completed canal, one of the largest storage reservoirs in the west, and where water is already being furnished to several thousand acres of land, and where there is available for immediate colonization the best of citrus fruit lands. Address,

Secretary Casa Grande Valley Canal Co.,

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MANUFACTURERS OF ALL SIZES



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Irrigating, Mining, Power Plants,
Artesian Wells, Water Works,
Town and Farm Supply.

SINGLE AND DOUBLE RIVETED.

WATER PIPE

Made in Sections of any Length Desired
12 to 28 Feet.

The Cut on the left shows a Section of Five joints
of pipe.

DOUBLE RIVETED IN LATERAL SEAMS.

Particular attention given to Coating Pipe with
our "EUREKA" Composition, a Special Mixture
Containing No Coal Tar. Iron Coated with this
Composition is Rust-Proof and Rendered Imper-
vious to the Alkalies of the Earth, is Practically
Indestructible.

Iron Cut, Punched and formed for Making Pipe on the
Ground Where Required.

309-317 Market St., San Francisco, Cal.

HORSE BLANKETS.

The patent of the Burlington Blanket Company, covering horse blankets, has been infringed. The company propose to protect their rights, and make the following statement:

"Without threatening or insinuation, we desire to inform you as members of the trade, that the patent upon this blanket is of great value to us and that its infringement is a direct wrong and injury to us which we are neither required nor disposed to endure. This invention of Mr. Ransom has marked an era in the manufacture of horse blankets, and the infringement of our rights is a tribute to the excellency of the invention more emphatic than any words of commendation which we might utter. Mr. Ransom's idea was the product of long and continuous study of the problem of properly covering the horse and keeping the cover attached during all his ordinary and natural movements." Circulars describing the patent and infringement can be obtained by addressing the Burlington Blanket Co., Burlington, Wisconsin.

A PROMINENT NURSERY.

Leonard Coates, of Napa, California, has been for some time vice-president of the California State Horticultural Society, and is one of its charter members. He is recognized as an authority on matters horticultural. In conjunction with his nurseries he has a ninety-acre fruit farm where all varieties are tested. The registered brand of "Sausal" fruits is becoming well known in Eastern markets.

His advertisement appears on another page.

The Prescott Courier.

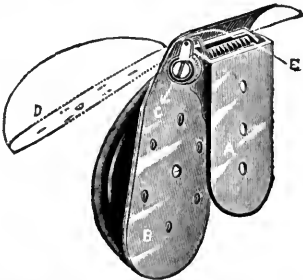
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THE COURIER, Prescott, Arizona.

THOROUGHbred STOCK.

The value and importance of keeping only thoroughbred stock is being recognized by farmers in general, but particularly by the irrigating farmers of the West. It costs no more to feed a good quality of stock than it does a poor one and their value and the profits are much greater. For an illustrated and descriptive catalogue of the best breeds of thoroughbred cattle, sheep, hogs, poultry and dogs, write to S. W. Smith, Cochranville, Chester county, Penn.



TRUSSES

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Book on Cause, Treatment and Cure of Rupture MAILED FREE.

ARTIFICIAL LIMBS. BEST LEG, Wood or Rubber Foot, \$50 to \$70. Elastic Stockings, Supporters, Crutches, &c. Free Catalogue, State particulars. **GEO. R. FULLER, U. S. Gov. Mfr., Box 2079 ROCHESTER, N. Y.**

NOTICE TO CONTRACTORS AND INVESTORS.

Notice is hereby given that the East Riverside Irrigation District of the Counties of San Bernardino and Riverside, State of California, will up to noon of the first day of February, 1895, receive bids for the construction of two main lateral pipe lines, known as the "South Main Lateral" and the "North Main Lateral," aggregating about four and one-half miles in length and varying in diameter from 22 to 7 inches. The said pipe lines are to be constructed of sheet steel, in accordance with plans and specifications prepared by F. C. Finkle, Chief Engineer of the District, and duly adopted by the Board of Directors. All bidders on the said works will be required to place a sufficient amount of the 6 per cent. interest bearing bonds of the District to pay for the improvement. For copies of the plans and specifications and any other information needed address W. R. McCully, Secretary of the East Riverside Irrigation District, East Riverside, Cal., or F. C. Finkle, Chief Engineer, Room 9, Farmers' Exchange Bank Block, San Bernardino, Cal.

By order of the Board of Directors,

EAST RIVERSIDE IRRIGATION DISTRICT.

By E. A. CHASE, President.

W. R. McCULLY, Secretary.

The pumping plant at Prosser Falls, Washington, which was supplied by the Stilwell-Bierce & Smith-Vaile Co., has been running four months and there have been no breaks of any kind. Reports say that the land irrigated by the water from this plant will yield sixty bushels to the acre of first-class corn, as well as splendid crops of all sorts of vegetables, fruits, castor beans, etc. Five months ago this land was simply covered with sage brush.

C. B. LIVERMORE, Real Estate,

120 Marion Street, Seattle, Washington.

To distribute seed evenly a salt shaker is just the thing.

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C. E. BEARDSLEY & CO.

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